adopted. More careful selection of seed, less seed sowing per acre, better ploughing, transplanting where possible, and more attention to green and artificial manuring will result in larger yields, and the economic position of the industry will be improved. Every effort is being directed towards the improvement of yields from existing lands, but unless cultivators respond to these efforts progress can only be slow. Many progressive cultivators and headmen are persistent in their efforts towards the improvement of paddy cultivation, but the number of workers required is considerable if any marked change is to be made within the next few years.

32. The investigation of the paddy fly pest has been continued by the Assistant in Entomology, and the results of his investigations have been prepared for publication. The poster, illustrative of the life history of the "paddy fly" and containing short details of control measures, was issued during the year in English, Tamil, and Sinhalese. These posters were distributed throughout all paddy-growing areas, and were appreciated.

33. The distribution of manure through Co-operative Credit Societies has been continued, but owing to the high cost of manures and to the fall in the value of paddy crops, the amount so distributed, 245 tons, was but slightly in excess of the amount distributed in the previous year.

34. The paddy hulling machine erected at the Anuradhapura jail has continued to work during the year, and has given fairly satisfactory results. Another mill has been erected by Mr. W. A. de Silva upon his lands under Nachchaduwa. The Ambalantota mill was closed for the greater part of the year.

35. Manioc, sweet potatos, and other tuberous foodstuffs have been grown in increasing quantities. The spread of manioc in the Eastern Province during the past few years has been marked. Dry grains continue to be grown in chenas, and crops were, on the whole, satisfactory. Hill paddy is grown in the wetter districts during the maha season, and the crops of this grain during 1921 were generally good.

36. A variety of soft-shelled Job's tear (*Coix lachrymæ-jobi*), known as Adlay in the Philippines, has been very well reported upon as a food grain. Small quantities of seed were secured and tried experimentally upon the Experiment Stations at Peradeniya and Anuradhapura. The crops were satisfactory, and increased acreages will be placed under this grain in 1922. It is possible that this grain may prove to be a useful addition to the dry grains already grown in Ceylon. Trials with different varieties of cholams (millets) have been continued in various districts. These grains are extensively cultivated over large tracts of India and Africa, and could be grown to advantage in the drier regions of the Colony. Experiments in the past have shown that these millets are seriously damaged by birds—particularly parrots—and therefore village cultivators have been slow to add them to their chena crops. During the year, however, it has been observed in more than one locality that whereas the white-grained types are badly attacked by parrots, the red-grained types are but rarely attacked. The further testing of this observation will be carried out during the next year, and, if confirmed, the distribution of red-seeded types undertaken among village cultivators.

SECTION II.

WORK OF THE DEPARTMENT OF AGRICULTURE.

Organization.

37. Considerable progress has been made during the year towards bringing into operation the scheme of re-organization, which has received the approval of agriculturists and the sanction of Government. Decentralization of the agricultural work has been proceeded with. Three divisions, viz., Central, Southern, and Northern, have already been established, and definite lines of work have been evolved and put into effect. The Agricultural Instructors, who were formerly attached to the Ceylon Agricultural Society, have been absorbed into the Department, and Divisional Officers are responsible for advice on all agricultural problems in their division, the work of experiment stations, and the supervision of the work of instructors, work in school gardens attached to elementary schools, co-operation, co-operative paddy manuring experiments, demonstrations in connection with the paddy industry, and field competitions for growers of paddy and vegetables. Minor Experiment Stations, in which varietal tests of the principal varieties of food crops are being carried out, are under their control, and steps for the further establishment of such stations have been taken. In the Southern Division experimental trial of cotton, to the extent of 60 acres, has been undertaken, in the Central Division experiments with tobacco are being continued, while in the Northern Division important work with fibres, limes, paddy, and oil palms are being carried out at the Anuradhapura Experiment Station, and with tobacco, food, and fodder crops at the Jaffna Experiment Station. A Divisional Officer for the North-Western Division was appointed during the year, but progress in the organization of this division could not be made owing to the Divisional Agricultural Officer, Southern, being deputed, at the request of the Colonial Office, for special duty in the Seychelles. Two additional Divisional Officers were sanctioned by the Legislative Council during the year, but these posts have not as yet been filled, owing to the necessity for financial economy. Mr. G. E. J. Hulugalle, Assistant Manager of the Peradeniya Experiment Station, was selected for the Government scholarship for additional agricultural training at Cambridge University, with the object of qualifying for a staff appointment.

38. The development of the division of inspection for plant pests and diseases is progressing satisfactorily. Several junior officers have completed their periods of training satisfactorily and passed the necessary examinations. Provision has been made for the Central and Southern Divisions, and early attention will have to be given to the organization of the North-Western Division, which will embrace the principal coconut-growing districts of the Colony.

39. Additional assistance has also been provided to the Division of Botany and Mycology. Mr. Bertus, who had been detailed to the Research Institute, Pusa, India, for additional training, returned during the year, and Mr. E. J. Livera, B.Sc., was appointed Assistant in Systematic Botany. Two additional posts of Assistant Mycologists were provided. It was difficult to secure suitably trained officers for these vacancies, and only one was filled. For financial reasons, this officer was seconded for duty under the Rubber Research Scheme, and the second vacant post abolished for the time being.

40. The increase of the work of the Department at Headquarters necessitated the appointment of a Librarian to have charge of the Library under the supervision of the Botanist and Mycologist and the appointment of a draughtsman for the Entomological division.

41. A complete re-grading of the subordinate branches of the Department was completed during the year, and increases of salaries sanctioned. The prospects of subordinate officers in the Department have been considerably improved, and augmented salary scales provided for those that have completed satisfactorily the courses of instruction provided at Indian Agricultural Colleges. Agricultural officers must continuously be increasing their scientific and practical knowledge, and with a view to encouraging officers to read and to make careful observations of practical agricultural operations in the field, junior and senior departmental examinations were instituted.

BOARD OF AGRICULTURE.

42. With a view to keeping the Department of Agriculture in the closest possible touch with agriculturists, the Board of Agriculture was formed in February and legally constituted by Ordinance No. 37 of 1921. This Board is Advisory to the Government and to the Department of Agriculture in all agricultural matters, and every endeavour has been made to secure that those responsible for the administration of the Department should be able to secure guidance, assistance, and advice from a body of practical agriculturists representative of the whole industry. Nominations to the Board are made by His Excellency the Governor, the Planters' Association, the Estate Proprietors' Association, the Low-country Products Association, the Agricultural Society, and the various Provincial Food Production Committees. Three committees—Executive, Estate Poducts, and Food Products—have been constituted. The following matters are amongst those considered by the Board during the year :—

Board of Agriculture.

AGENDA OF MEETINGS DURING 1921.

Provision for food production on lands alienated from the Crown for agricultural purposes.
Development of the Economic Resources of the Colony and the provision of laboratories and staff for the Agricultural Department.

Food Products Committee.

AGENDA OF MEETINGS DURING 1921.

Paddy manurial experiments.
The general requirements of the people for the development of food products.
Work on Sravasti estate, Nachchaduwa.
Provision for food production on lands alienated from the Crown for agricultural purposes.
Rotation of crops in chenas.
Reduction of railway rates on straw transported to the Northern Province.
The necessity of establishing demonstration plots.
Paddy growing and vegetable garden competitions.
Fodder grasses for the drier districts.
Poultry rearing.
Experiments in connection with the transport of milk from up-country.
Paddy manurial experiments, 1921–22.
Agricultural competitions : vegetable gardens and paddy.
Improvement of varieties of paddy.
Paddy cultivation by means of prison labour.
Bunchy top disease of plantains.
Consideration of irrigation schemes of the Matale District.

Estate Products Committee.

AGENDA OF MEETINGS DURING 1921.

March, 1921.

Report of the Mycologist on Diseases of Crops during 1920.
Report of the Entomologist on Pests for 1920.
Black scale bug upon plants in Haputale district.
Report of the Inspector of Plant Pests and Diseases.
Tractor trials.
Rubber manurial experiments, Peradeniya, 1920.
Rubber tapping experiments, Peradeniya, 1920.
Coconut trials, Chilaw, 1920.

May, 1921.

Rubber manurial experiments, Peradeniya.
Cacao manurial experiments, Peradeniya.
Coconut manurial experiments, Chilaw.
Coconut experiments, Negombo.
Proposed arrangements for tractor trials.
Brown bast.
Latex tubes of Hevea.
Cultivation of pineapples.
Brown bug in Haputale district.
Shot-hole borer investigations.

July, 1921.

Tractor trials.
Report on Government Entomologist's visit to Batticaloa.
Report on Coconut Experiments on Alexandra estate, Ja-ela.
The cause of rust and mould on smoked rubber sheets.
The possibilities of manufacture and sale of rubber articles on a commercial basis by estates.
Red rust on tea.
Provision for food production on lands alienated from the Crown for agricultural purposes.

September, 1921.

Consideration of the desirability of declaring fomes, ustulina, and poria under the Diseases and Pests Regulations.

The coconut caterpillar at Batticaloa, and consideration of declaring this pest under the Diseases and Pests Regulations.

Disinfection of imported tea seed.

The feasibility of presenting results of manurial experiments in future in graph form, instead of by figures as at present.

The effect of manures on (1) quality of tea ; (2) tea blights.

The improvement or deterioration of soils under rubber.

The need of more experimental plots with new products.

The pruning and disposal of prunings of the tea manurial plots on the Experiment Station, Peradeniya.

November, 1921.

Further consideration of the desirability of declaring fomes, ustulina, and poria under the Diseases and Pests Regulations.

Disinfection of imported tea seed.

Shot-hole borer regulations.

Report by the Mycologist and Entomologist on Tea Manurial Plots at the Experiment Station, Peradeniya.

Experiments with economic products.

The grafting and selective cultivation of Hevea.

The cultivation of lac.

The desirability of experiments to ascertain the soil constituents removed annually by a crop of nuts and by toddy.

The necessity for further re-afforestation by tea estates up-country.

The improvement of the quality of coconuts by manuring.

These meetings have been open to the Press and have been closely followed by agriculturists. They also afford an opportunity for the staff of the Department of Agriculture to present at the earliest possible date the results of their inquiries, researches, and investigations. The minutes of the meetings and brief statements of results of experiments and investigations dealt with have been regularly published in the "Tropical Agriculturist," which has been taken over during the year by the Department as the Journal of Agriculture for Ceylon.

AGRICULTURAL RESEARCH INSTITUTE.

43. Acquisition of land from New Peradeniya estate for the purpose of providing an adequately equipped Agricultural Research Institute was completed during the year, and the building of an Entomological laboratory and of three bungalows for research officers put into hand. The work on these buildings has been pushed on, and they will be completed early in 1922. Plans have also been prepared for the new Mycological laboratory, and funds provided for the completion of this building during the financial year 1921-22. The full proposals for the adequate provision for agricultural research were detailed in a report on "Scientific Research and Investigation in regard to the Agricultural Industries of Ceylon" in response to the Circular Despatch of the Secretary of State for the Colonies regarding the necessity for the development of Scientific and Industrial Research. The proposals for agriculture were considered by Committees appointed by Government. They strongly supported the proposals, and "considered that the work should be proceeded with without delay," and recommended that additions to the staff should proceed *pari passu* with the completion of the laboratories. Sessional Paper VI. of 1921 dealing with the development of the Economic Resources of the Colony contains the details of the proposals on behalf of agricultural industries.

RUBBER RESEARCH.

44. The amalgamation of the research work in Ceylon of the Rubber Growers' Association and the Ceylon Rubber Research Scheme was completed in 1920, but final details were not settled until early in 1921. The new scheme provides for chemical research with rubber to be carried out at the Imperial Institute, and for a Chemist, Physiological Botanist, Mycologist, and an Inspector and Secretary for work in Ceylon. The Executive Committee in Ceylon was appointed during the year, and at the end of December consisted of the following :—Director of Agriculture (Chairman), the Hon. the Colonial Treasurer, Mr. M. Kelway Bamber, Mr. W. Coombe, Mr. J. F. Elford, Mr. R. Garnier, Mr. F. H. Layard, Mr. L. M. W. Wilkins, Mr. D. S. Cameron, Mr. F. J. Poyntz-Roberts, Mr. A. D. Callandar, Mr. G. P. Madden, and Mr. H. D. Garrick.

The Advisory Committee in London consisted of the following :—Director of the Imperial Institute (Chairman), Sir Edward Rosling, Sir Stanley Bois, Mr. G. H. Golledge, Mr. F. W. Barker, Mr. H. Eric Miller, Mr. Herbert Wright, Mr. Percy Rosling, Mr. W. A. Williams, Mr. A Johnston, Prof. J. B. Farmer, and Dr. D. F. Twiss. The selection of some officers was made during the year. Mr. M. Park, Assistant Mycologist, Department of Agriculture, was seconded to the scheme as Mycologist; Mr. G. Martin was selected on probation as Chemist in London ; Mr. T. E. H. O'Brien as Chemist in Ceylon ; and it is probable that selections for the post of Physiological Botanist and of Inspector and Secretary will be made early in 1922. Programmes of work have been discussed, and arrangements for co-operation with the rubber research stations of the Dutch East Indies are under consideration.

PLANT PESTS AND DISEASES.

45. Annexure I. gives detailed information regarding the work of the Division of Botany and Mycology. Owing to the year being a dry one, diseases of rubber were less prevalent than usual. Root diseases, however, continued to give trouble, and a fair number of specimens were submitted for examination.

46. Red rust of tea was common in certain districts, and has received special attention during the year. This is recognized as a disease of weak bushes, and can be checked by improvement of cultivation and by the application of manures. Branch canker has also been fairly common, and may be attributed to the cessation of manuring during 1920 and the war period. The leaf disease of tea caused by *Cercosporella theæ* has in almost all cases been found to originate on acacias and to spread from them to tea. It is now frequently met with in several up-country districts during wet weather, and whether it is advisable to continue the planting of acacias through tea as green manure plants and as shade trees, particularly in wet districts, deserves very careful consideration. The investigation of the system of disinfection of tea seed

at the Fumigatorium, Colombo, with formaldehyde was completed during the year, and the results of these investigations were placed before the Estate Products Committee of the Board of Agriculture. After full discussion, it was concluded that this method of disinfection did not provide adequate safeguard against the introduction from India of leaf blister blight, and therefore it was decided, in the interests of the tea industry, to prohibit any further introductions of tea seed from India.

47. Coconut diseases have received close attention during the year. Owing to the dry season the incidence of disease in coconuts has been less than in previous years. Investigations have shown that nut-fall and leaf droop may be brought about by physiological causes as well as by the direct attack of the species of *Phytophthora*. A few cases of bud-rot have been investigated during the year, and it is urged, owing to the virulent nature of this disease, that all diseased palms should be destroyed by fire immediately they are noticed.

48. It has been possible during the year to pay special attention to the bunchy-top disease of plantains. This disease first appeared in 1913 in Colombo, and was probably introduced. Since that year its spread has been noted in several other districts, but, owing to depletion of staff during the war period, it was found impossible to arrange for a complete investigation of the disease. Investigations have been carried on during the year by the Assistant Botanist and Mycologist, but conclusive evidence as to the causes of the disease has not as yet been secured. The extent of the disease in the Western Province is being ascertained, and brief instructions as to how it may be controlled have been issued.

49. Annexure II. deals with the work of the Entomological Division. Pests of tea have received attention during the year. Extensive outbreaks of scale insects and of tea mites occurred upon some estates up-country. These pests attack bushes in low vigour, and have become common in some districts where cultivation and manuring programmes have been restricted during the past few years. It is not anticipated that they will cause serious damage if careful attention is now given to an improvement of cultivation and to adequate manuring. Tea termites have been reported from several estates, and continue to be a serious pest. Further investigations of the termites which affect tea in Ceylon are required. Tea tortrix has been prevalent in certain areas during the year. This pest has been thoroughly investigated, and can be controlled by the establishment of flight breaks, upon which the pest can be dealt with by spraying. But few estates have as yet begun to establish these flight breaks, and until this is done periodic outbreaks of the pest are bound to occur. The shot-hole borer investigations have been continued. Burial of pruning experiments have been carried through to completion, but only four substances—Kerisol, Agrisol, Apterite, and Phenol—showed any benefit. Manurial experiments are also in hand in order to ascertain whether shot-hole borer attack is curtailed by manuring, and whether any particular manurial constitutent has any definite effect, either upon preventing attack or of healing galleries. There is a general opinion amongst planters that good cultivation and heavy manuring will check attacks of shot-hole borer, and observations indicate that such is the case. During the year much healing of galleries has been noted in several districts. This has been attributed to improved cultivation and to the resumption of full manurial programmes. It is clearly evident from returns which have been collected that shot-hole borer is now considered to be less prevalent, except in the Badulla, Haputale, Knuckles, Kotmale, Medamahanuwara, and Wattegama districts. Experiments with castor as a trap are being continued, but no definite results have so far been secured. Coconut pests have received special attention during the year, particularly the coconut caterpillar (*Nephantis serinopa*); outbreaks of this pest have occurred in the Eastern, Southern, and North-Western Provinces. The outbreak in the Eastern Province has been very severe, and serious damage was occasioned. The pest was declared under the Plant Pest and Diseases Ordinance, and a Plant Pest Sub-inspector detailed for special duty in the Province. Estates readily adopted the remedial steps specified for the control of this pest, but small growers were at first indifferent, and then, subsequently, worked up an opposition to the proposals which were made by the Government Agent for the provision of an adequate local inspecting force. It is expected that during the coming year all growers will realize the considerable damage that is being done by this pest in the Eastern Province and will co-operate in the adoption of adequate control measures. The paddy fly investigations have been continued, and the whole of the life history of this pest worked out. Various control measures have been experimented with, and a full report upon the investigations made up to date has been prepared for publication. The weevils attacking plantains have also been investigated during the year. They are causing damage in neglected plantations and in those which have not been re-planted for several years. The snail pest continues to attract attention. Some quarters have urged that it should be declared a pest, but no useful purpose would be served by such action. To a certain extent it may be kept in check by collection, and vegetable gardens can be protected by rings of sawdust, or by sawdust watered with a 10 per cent. solution of copper sulphate.

50. Annexure III. gives details of the work of the Division of Plant Pests and Diseases Inspectorate. Mr. Jardine was in charge of the Central Division until July 20, when he proceeded on leave, and from that date the duties of his office were performed by the Assistant Entomologist. Mr. A. T. Reeve arrived on October 1, and spent seven weeks at Headquarters, making himself familiar with the system of work of the Central Division, and from November 21 took charge of the Southern Division with headquarters at Avisawella. The Central Division has concentrated upon the shot-hole borer pest of tea. A total of 262 estates and 824 gardens were inspected during the year. Shot-hole borer was found to be present on most of them, but reports indicated that there appeared to be some decrease in the prevalence of the pest. All infected estates were accordingly circulated, and the results of the replies to these inquiries have been tabulated and analysed in the "Tropical Agriculturist," Vol. LVIII., No. 2. The general opinion of estate superintendents is decidedly against shot-hole borer being more prevalent on estates. It is, however, extending its sphere of attack to new areas in the Badulla, Haputale, Knuckles, Medamahanuwara, and Wattegama-Panwila districts, and is extending upon estates already affected with the pest in the Haputale and Medamahanuwara districts, and to a lesser degree in the Knuckles, Madulsima, Ratnapura, and Wattegama-Panwila districts. In all other districts the borer is not spreading either to new areas or to previously unaffected portions of estates. In some districts, and particularly upon some estates, there has been a very marked decrease in the pest.

51. The inspection of village gardens has brought to light the fact that in many instances gardens are really nothing more than nurseries—the regular cultivation of tea not being carried on. Permits to remove tea plants from nurseries have been issued on ninety occasions during the year, and eighteen applications for permits were refused. The illicit removal of tea plants has been brought to the attention

of the Department during the year, and the necessary action taken. During the year it was found that the regulations affecting the removal of tea plants were working hardship in some instances, and after consideration by the Estate Products Committee of the Board of Agriculture, it was decided that the regulations should be so amended as to allow of removal of tea plants only on permit from the Department of Agriculture, but to allow tea plants to be removed from one infected estate or garden to another infected estate or garden within the infected areas, provided they do not, in transit, enter areas known to be free from the pest.

52. The Southern Division will concentrate upon the pests and diseases of rubber and low-country products. Ten estates and eighty-one gardens were inspected during the year under review. The coconut caterpillar (*Nephantis serinopa*) was scheduled under Ordinance No. 6 of 1907 during the year, and one Sub-Inspector was detailed from September to the end of the year to the Batticaloa District to assist in the control of a severe outbreak of the pest in that area. The bunchy-top disease of plantains has received attention by officers in the Southern Division. Its present distribution is being recorded, and inquiries are being made as to varieties that are immune to the disease.

53. A poster illustrating the several stages of the life history of shot-hole borer was issued in English, Tamil, and Sinhalese, and distributed throughout the tea-growing areas. These posters were greatly appreciated, and frequent reports are being received as to the value of the work being done by the Inspectors and Sub-Inspectors of Plant Pests and Diseases—particularly in educating the small growers to the importance of crop pests and diseases and to the necessity for keeping them in check and under control.

CHEMICAL INVESTIGATIONS.

54. Annexure IV. details the analytical work carried out by the Government Agricultural Chemist. A total of 245 samples have been analysed during the year. The most important investigations carried on during the year relate to analyses of paddy soils, forest soils, and of Ceylon grown limes. Samples of paddy soils have been secured from all Provinces in the Island and from most of the large paddy-growing areas of all countries in the East. The analytical work was completed during the year, and the results written up for publication in bulletin form. These analyses indicate that Ceylon paddy-growing soils differ considerably in their mechanical composition from the paddy soils of Burma, Indo-China, and other areas which yield large crops of grain. The coarser particles are in greater percentage in Ceylon soils, and, therefore, they are in general less retentive of moisture, and much more liable to the effects of periods of dry weather. Ceylon soils in many localities are comparatively poor in mineral matter, and in some instances in organic matter. These analyses demonstrate the causes of the poor yields which are obtained from several of the Ceylon paddy-growing areas, and demonstrate the importance of the application of green manures and of phosphatic manures if larger crops are to be hoped for. The paddy manurial experiments carried out by the Department during the maha season of 1920–21 have been reported upon by the Agricultural Chemist, and the complete results reported in "Tropical Agriculturist," Vol. LVII., No. 1. Those plots manured with green manure and with 1 cwt. of Ephos phosphate gave satisfactory results. All plots, except a few in the Galle, Matara, Kalutara, and Trincomalee Districts, showed increases of yields. In the last district, the plots were damaged by floods, and the yields, therefore, cannot be accepted as reliable. The Galle paddy soils are peaty in character, and further investigations in this District and in Matara and Kalutara are being undertaken. In view of the interest taken in the possibilities of the cultivation of limes in the Colony, it was thought desirable that analyses of limes for their citric acid content should be undertaken. The results of these investigations were published in the "Tropical Agriculturist," Vol. LVII., No. 5. The average weight of a Ceylon lime during dry weather was 36·7 grammes and during wet weather 47·0 grammes, while the citric acid content averaged 11·66 oz. per gallon of juice during wet weather and 13·4 oz. per gallon of juice during dry weather. The West Indian limes average 66·7 grammes in weight, and have a citric acid content of 13·3 to 14·4 oz. per gallon of juice.

The analyses of soils that have been under rubber on the Experiment Station for several years have been made, as well as of soils which are under rubber manuring experiments. The results of these analyses have been tabulated and will be published in due course. The analyses of the leaves of tea grown on the manurial plots at Peradeniya have not shown any marked variation.

The Agricultural Chemist also has in hand analyses of forest soils for the Forest Department, and investigations into the oils of castor, rubber, kekuna, domba, mé, &c.

Other investigations have been undertaken with the oils of locally-grown Chenopodiums, and analyses have been made by the Agricultural Chemist, and trials of the locally-prepared oils have been carried out by Dr. Jacocks in co-operation with the prison authorities. The locally-grown oil differs somewhat in character to the American produced oil. It is an efficient vermifuge, but is slightly less effective than the American product.

ECONOMIC BOTANY.

55. Annexure V. details the work of the Division of Economic Botany. Attention is still concentrated upon the improvement of paddy varieties for yield. This work is being carried out on the Experiment Stations of Anuradhapura and Peradeniya. During the maha season, 1920–21, 421 pure lines of ma-wi selections and 155 pure lines of samba selections were grown at Anuradhapura, from which 45 ma-wis and 7 sambas were selected for comparative yield tests in plots of standard size during the 1921–22 maha season. At Peradeniya 179 lines of ma-wi and 44 lines of samba were grown. During the yala season, 46 selected lines of short-aged paddies were sown at Anuradhapura and 8 further lines in larger areas for comparative trials and seed multiplication. 392 selections of short-aged paddies were also sown. At Peradeniya 3 lines were sown for comparative trials and 235 types for selection. Selections from these paddies have been made for comparative tests during the next yala season. The work at Anuradhapura is progressing satisfactorily, and further paddy land will shortly be required. Small lots of selected paddies are becoming available for experimental trial by cultivators, and seed has already been supplied to three cultivators for comparative experiment. It is not proposed to make any general distribution of improved paddy types until they have been fully tested, and with a view to organizing a satisfactory system of testing, communciation has been established with the official Seed Testing Station of the United Kingdom. The work at Peradeniya has been handicapped by inferior soil, which is very irregular in character, and by a severe shortage of water during the whole year.

CENTRAL EXPERIMENT STATION, PERADENIYA.

56. The report of this station is given in Annexure VI. The progress of the work on this station is given in bi-monthly reports, which are placed before meetings of the Estate Products Committee of the Board of Agriculture, and subsequently published in the "Tropical Agriculturist." The results of the tea manuring experiments up to end of 1920 appear in Vol. LVI., No. 2. The dadap plot still maintains its larger yield. All plots were pruned in October and November, but came into bearing slowly owing to the dryness of the season. The supplying of the new area opened in tea has been continued. The satisfactory growth of *Gliricida maculata* as a green manure for tea upon the Experiment Station has attracted attention, and supplies of stumps have been made to several tea estates. Several supplies made in the Uva District have proved to give very satisfactory growth. At Peradeniya dadaps lopped in September-October after an interval of seventeen weeks gave 31 lb. of green material per tree, while *Gliricidia* lopped at the same time after an interval of eleven weeks gave 56 lb. of green material. Accurate figures of yields of green material are being kept, and analyses of loppings are being carried out. An examination of the roots of *Gliricidia* and dadaps showed that while the nodules on the latter were larger, they were not so numerous as on the former. Everything seems to indicate that *Gliricidia maculata* is a green manure worthy of extended trial upon tea estates up to an elevation of 3,000 feet. Whether it will be useful at the higher elevations has yet to be tested. The yields of the cacao manurial experiments were discussed by the Estate Products Committee at their meeting in May. The results have been very inconclusive owing to the mixed character of the plots under experiment. It was decided to discontinue the manurial experiments after this year, except in the young area of 4½ acres, which was planted from the seed of one individual tree. The spring crop of cacao was very short, but the autumn crop was exceptionally heavy. The rubber manurial experiments have been continued. The plots at Peradeniya show no increased yields from the applications of manures, and upon alluvial soils similar to those used upon the Experiment Station for these experiments it would appear to be evident that no advantage is to be gained by the application of artificial manures to rubber. The growth of the young rubber in the new manurial experiments is being carefully recorded, and a further extension of this series has been undertaken during the year. The two- and three-day tapping experiments have been continued, and the results published in summary. The two acres of nine-year old rubber grown from Henaratgoda No. 2 seed has been tapped to ascertain individual yields. The results of the yields up to the end of the year have shown the following :—

REPORT on Individual Tree Yield Experiment Plots 14 and 15, Experiment Station, Peradeniya, from April 1, 1921, to December 31, 1921 (9 months).

The experiment is being carried out on a block of rubber planted in June, 1912, from seed of No. 2 tree Henaratgoda, the tree which has given the largest recorded yield of rubber in Ceylon. The area is 1·78 acres.

The ground slopes slightly from the south-west corner of the block, but is, on the whole, even.

The object of the experiment is to study—(1) the extent to which the seed of a high yielding tree will transmit its yielding capacities to its offspring, and (2) the factors which influence variation in yield.

The rubber was planted 20 feet by 15 feet or 145 trees to the acre.

In 1916 the trees were thinned by selection, leaving 161 trees at the time of commencement of the experiment, equal to 90 trees per acre.

One result of this thinning is that the remaining trees have a greater access to light and air than is usual ; there are, in fact, only six trees which have not a clear space on at least one side.

Tapping was commenced on April 1, 1921, one cut on the half at 24 inches from the ground at an angle of 16°, tapping on alternate days.

The latex from each tree is coagulated, rolled, and dried separately. The scrap is also collected separately.

The first period now under review deals only with a period of nine months, and does not, therefore, afford an adequate foundation for comparative study of the yield per acre.

The yield for the whole area for the nine months is 579 lb., of dry rubber equal to 325·3 lb. per acre or 3·59 lb. per tree.

It is found that 68·9 per cent. of the trees gave 75 per cent. of the yield.

It is found that 42·8 per cent. of the trees gave 50 per cent. of the yield.

It is found that 19·8 per cent. of the trees gave 25 per cent. of the yield.

Whitby, working in the Federated Malay States on 1,011 trees of mixed parentage, found that 9·6 per cent. of the trees gave 28 per cent. of the yield.

The trees may be conveniently divided into four classes of yielders :—

Class A trees, which gave between 5 and 6 lb.	..	.. 7 in number
Class B trees, which gave between 4 and 5 lb.	..	.. 42 in number
Class C trees, which gave between 3 and 4 lb.	..	.. 76 in number
Class D trees, which gave between 2 and 3 lb.	..	.. 36 in number

The average girth measurement for the whole block was 31·49 inches at 3 ft. from the ground at the commencement of the experiment :—

The average girth of Class A was 35·48	The average girth of Class C was 31·40
The average girth of Class B was 34·65	The average girth of Class D was 27·19

Girth and yield therefore run fairly closely together in this case.

The question of environment is then considered.

Apart from the question of light and air other external conditions appear very similar for all the trees. As a result of the thinning, the majority of the trees have a clear space on one, two, three, or even four sides.

The figures below represent the average number of sides of trees open to air and light :—

Class A 2·25 sides	Class C 1·68 sides
Class B 1·88 sides	Class D 1·88 sides

It is to be noted that the Class A containing the best yielders with the best growth are trees which have received somewhat more light and air than the remainder ; on the other hand, Classes B and D have received an identical amount.

The average increase in girth per tree in the whole block during the nine months is 2·56 inches.

In July, 1921, the plot was ploughed and cross ploughed.

The highest monthly yield was obtained in December, 1921.

T. H. HOLLAND,
Manager, Experiment Station, Peradeniya.

Examinations of the bark of these trees have been made by officers of the Division of Botany and Mycology and correlations between yield and girth, yield and bark thickness, yield and number of latex tubes, &c., are being worked out. Trials of green manure in young rubber have been undertaken. Horse gram (*Dolichos biflorus*) has given satisfactory results, and has proved markedly successful in keeping down weeds. An area of young rubber has been interplanted with Robusta coffee with the object of testing the growth of this crop under rubber.

57. Particular attention is now being given to the cultivation of Robusta types of coffee. Those varieties obtained from Java are growing well, and others have recently been secured from the Belgian Congo.

The following table shows the average yield of berries per tree of different types of Robusta types of coffee :—

	1919–20. lb. per Tree.	1920–21. lb. per Tree.
Robusta (7–11 years)	1·34	1·37
Uganda (6 years)	2·06	2·26
Quillou (6 years)	2·81	1·17
Canephora (5 years)	1·87	1·57
Hybrid (5 years)	—	1·21

The demand for seed and plants of these coffees still continues.

58. Agriculturists interested in stock are frequently asking for information regarding the fodder grasses which are recommended for cultivation. Accurate details regarding the yields of various grasses are not available, and therefore regular 1-acre plots of fodder grasses have been established, and weights are being regularly recorded. The preliminary figures obtained have been as follows :—

	Average Weight per Cutting per Acre. Tons.	Average Interval between Cuttings. Days.
Guinea grass A (known at Peradeniya as elephant grass) ..	2·5	24
Guinea grass B (the ordinary Guinea grass) ..	3·6	24
Water or Mauritius grass	5·1	44
Paspalum virgatum	2·3	24

Plots of Rhodes grass (*Chloris gayana*) and of the Golden crown grass (*Paspalum dilatatum*) have also been established, and supplies of Kikuya grass (*Pennisetum longistylum*) and Sudan grass (*Pennisetum purpureum*) have also been obtained, and are being propagated for planting out in regular plots for comparative tests.

59. Trial distillations of camphor were carried out as long as water was available for condensation. The results have not been satisfactory, and various experimental changes of the distilling plant have been made. Analyses of camphor leaves from plants grown at high elevations (Hakgala) and of leaves from plants growing at Peradeniya, 1,600 feet, have shown a camphor content of ·84 per cent. and ·63 per cent. on the fresh material respectively. Further experiments will be made with the object of testing whether the camphor content of high-grown camphor is invariably greater than in the case of trees growing at lower elevations.

60. The work of the establishment of the permanent economic area has been continued. Plots from selected trees are being established with the object of having an area of economics of known high quality available for purposes of supply. Another area for the testing of annual crops of economic value is being prepared, and will be ready for sowing with the south-west monsoon of 1922.

The yields of maniocs (cassavas) imported in 1916 from Mauritius have been as follows :—

	December, 1918. lb. per Acre.	December, 1919. lb per Acre.	August, 1921. lb. per Acre.	Average of Three Crops. lb. per Acre.
Smallings	28,672	10,103	12,576	17,117
Singapore	21,504	5,878	9,619	12,334
Manioc de Table ..	16,128	10,556	5,792	10,852
Cassava Beurreum ..	10,752	6,584	14,338	10,558
Butter stick	14,336	10,321	4,800	9,819
Trinidad	15,232	8,045	5,315	9,531

Comparative tests were made with millets, maize, and sweet potatos. Millets do not succeed well at Peradeniya, owing to the dampness of the climate; maize in dry years gives good results. Sweet potato variety trials on a large scale are being arranged for.

61. Advantages have been taken of the dry year of 1921 to eradicate weeds from the Experiment Station. It is now clean, and in generally satisfactory order. Roads still require considerable attention. Foundations have been prepared for some of the main roads, and it is proposed to pay particular attention to the roads of the station during the forthcoming year.

TRACTOR TRIALS.

62. Competitive tractor trials were held, with the kind permission of the Directors of the Ceylon Coconut Company, Limited, on Clovis estate, Kurunegala, on June 17 and 18.

63. The trials were designed to test the relative merits for work upon coconut estates of the various types of tractors in the Island. Areas of 4·3 acres of old coconuts were marked out, and the tractors were required to plough this area to a depth of 6 inches, cross plough it, and finally to disc harrow the ploughed area.

64. Four types of tractors entered for this competition, viz., Sanderson, Cletrac, Avery, and Fordson. The detailed results have been published in "Tropical Agriculturist," Vol. LVII., No. 1, and need not be recapitulated. The gold medal was awarded by the judges to the Cletrac, which worked an Oliver D 43 three-disc plough and a double twenty-disc harrow. It gave results which worked out as follows :—

		Rs. c.
Total nett cost of work per acre, ploughing		5 90
Do.	cross ploughing	5 85
Do.	harrowing	1 26

The fuel consumption per acre was 2·4 gallons of kerosine, ·022 gallons of petrol, and ·2 gallons of lubricating oil for ploughing ; and ·45 gallons of kerosine, ·03 gallons of petrol, and ·05 gallons of oil for harrowing. The average acreage per hour was—

	Acres.
Ploughing	·69
Cross ploughing	·5
Harrowing	3·45

65. The trials were fairly well attended, and attracted considerable attention amongst growers of coconuts. The ploughing and proper cultivation of coconuts has been stimulated by these trials, and the use of tractors is gradually extending upon the larger estates.

Live Stock.

66. The recommendations of the Cattle Breeding Committee that experiments should be made with fodders, with the transport of milk from up-country, and with a tick survey, have been put in hand. Trials with fodders are being carried out at Peradeniya, Anuradhapura, and Jaffna Experiment Stations, while further experiments in co-operation with estates in the drier areas of the Colony are under contemplation.

67. A thorough test of the possibilities of transporting milk from up-country to Colombo was entrusted to the Divisional Agricultural Officer, Central, with the co-operation of the Government Analyst. As the result of these investigations it was found that transport may be made by either night train or by day train, and that if sterilized milk is transported to Colombo in ice, it is necessary that it should be distributed at once, or that it should be stored on ice. It lasts fresh at ordinary temperature of Colombo for from 6 to 8 hours. It has also been ascertained that the Grass Farm Department of the Indian Army has found it possible to send milk long distances in good order, even in the hottest weather, after the milk has been pasteurized and freezed. The transport is effected in insulated vans in which the temperature is reduced by a liberal supply of ice.

68. The question of the provision of special vans was then considered by the Railway Department. The cost of the construction of such vans would be heavy, and a large transport of milk would have to be assured before the expenditure of such large vans would be justified. A small beginning has been made with the transport of sterilized milk in special bottles from Negombo to Colombo. Special rates have been granted by the railway, and the demand for this milk in Colombo at remunerative prices is good. It is thought that this form of transport of sterilized milk should be developed before further consideration is given to the construction of special refrigerating vans.

69. The Hissar cattle obtained by Kondesalle estate through the Department from the Government Hissar Farm in the Punjab are flourishing, and considerable improvement of the Kondesalle herd of cattle may be anticipated.

70. The Freisian bull imported by the Hon. Dr. H. M. Fernando continues to prosper, and several fine Jumna Pari goats were imported from Lucknow by the same gentleman through the Department.

71. Some pure Gujerat cattle in the Southern Province were also inspected during the year. They appear to promise well.

72. The establishment of a small dairy at the Agricultural School, Peradeniya, could not be carried out during the year for want of funds, but provision for this work is being made during the next financial year. There is no doubt that the training of the youth of Ceylon in the breeding of cattle is most essential. There is no reason why fine cattle should not be bred in the Colony if proper attention is given to selection and to feeding. India cannot be depended upon for the entire supply of cattle, and further interest in the breeding of cattle and other stock is desirable.

73. As the result of the high prices obtained for tobacco in the Jaffna peninsula during the year, 1,747 cattle to the value of Rs. 250,000 were imported from India through Kayts. During the dry season the question of fodder for these cattle will be a serious problem. Representatives from Jaffna on the Board of Agriculture have raised the question of providing for cheaper railway rates on paddy-straw to Jaffna, and it is possible that this may be provided if satisfactory "trussing" can be carried out. Experiments in this direction are under contemplation, and if successful should assist towards this problem. If adequate supplies of straw cannot be secured, then the growth of further fodder crops for cattle will have to be taken up.

74. The question of cattle breeding in Ceylon is intimately bound up with the question of food, and village owners of cattle still seem to think that it is the duty of the cattle to find the food for themselves, and that it is not incumbent upon their owners to make provision for the food of animals that could be of material assistance to them in their agriculture.

Food Production.

75. The special Department of Food Production was closed, with effect from March 31, 1921, and the work of the Department was divided amongst the various Provincial Revenue Officers, the Department of Agriculture, and the Controller of Revenue with the following order of Government :—

(1) The Director of Agriculture will deal with the following matters, and communications in regard to such matters should be addressed to him in the first instance :—

- (*a*) The education of agriculturists in improved methods of cultivation by means of personal tuition, by lectures and dissemination of information by leaflets, and by demonstrations ;
- (*b*) The offering of prizes to encourage villagers to adopt improved methods of cultivation, and the arrangements for agricultural shows ;
- (*c*) The grant of assistance to agriculturists undertaking experiments and demonstrations and of assistance to cultivators in opening and working their lands, by means of advances for manure, seed, &c., through co-operative credit societies, central and paddy banks, &c. ;
- (*d*) The collection and distribution of seed, and the preparation of agricultural statistics ;
- (*e*) Matters connected with the breeding of cattle, poultry, &c. ; and
- (*f*) Proposals for special agricultural leases.

(2) The general oversight of areas in the various Provinces leased to food production companies and matters connected therewith will be vested in the respective Government Agents, who should refer to the Controller of Revenue, after consultation with the Heads of other Departments concerned, any matters in which they desire advice and guidance.

(3) Work in connection with leases of small areas will be dealt with by the Government Agents concerned, who will refer to the Controller of Revenue any cases of disagreement with other Departments.

(4) The Government colonies will be administered (under the immediate supervision of the Colonization Officer) by the Government Agents concerned, any matters beyond their authority being submitted to the Controller of Revenue for instructions. The expenditure on such colonies for the remainder of the current financial year will be met from the apportionments already made by the Director of Food Production from his vote for "Colonization and Food Production Schemes." The Controller of Revenue will control expenditure from the balance on this vote this year, and application to incur further expenditure in excess of the apportionments referred to above should be addressed to him. For future years the provision made will be based on estimates submitted by the Government Agents concerned, and will be voted under Head 5, Controller of Revenue. The Government Agents should forward such estimates in time to the Controller of Revenue to enable him to include the necessary lump sum on this account in his Draft Estimates for the year. The anticipated expenditure for 1921–22 should be reported immediately to the Controller, so that the necessary provision may be made in the estimates for the next financial period.

(5) Proposals for irrigation works and for surveys required for food production schemes must be submitted to the Controller of Revenue through the Director of Irrigation and the Surveyor-General, respectively.

(6) Revenue Officers must submit annually to the Controller of Revenue, through the Director of Irrigation, statements of the roads in their respective Provinces which they recommend should be constructed or improved to facilitate the transport of food products. The Controller of Revenue will, after consulting the various officers concerned, submit to the Government for approval a list of the roads on which he recommends that work should be undertaken.

76. The efforts of the Department of Agriculture have been directed towards increasing the crops from existing paddy lands. Prize-holding competitions have been arranged in the various districts under the supervision of Divisional Agricultural Officers and Agricultural Instructors; manurial experiments have been carried out at sixty centres, transplanting competitions arranged, and demonstrations in ploughing, transplanting, manuring, and seed selection given in those areas where such practices were not in vogue. Special attention has been given also to the selection work of the Economic Botanist and to the supply of good seed.

77. The Minneriya Food Production Company went into liquidation early in the year, as there appeared to be no prospect of their undertaking becoming even self-supporting.

78. The efforts of Mr. W. A. de Silva under Nachchaduwa have been much more successful, and satisfactory crops of grain were raised. An account of this pioneer work has been given by Mr. de Silva to the Food Products Committee of the Board of Agriculture. Several visits were made to this food-producing project during the year, and every assistance given as far as possible. The erection of a small rice mill on the property is an enterprise that will be watched with interest. Several visits have also been made to the Government colony at Ratmale, and some of the committee meetings relating to the administration of the colony attended. This colony is making slow and steady progress, but there is some prospect that several outstanding loans to cultivators will have to be written off as irrecoverable. Visits have also been made to the lands being cultivated by the Ceylon Mills Food Production Company at Kalawewa. The crops upon some areas were exceedingly promising, but improvement of transport facilities for the property is desirable. The Low-country Food Products Company have cultivated 181 acres with paddy, 1½ acre with cotton, 15 acres with kurakkan, and 2 acres with maize. The low-land paddies were fair in certain areas, but others do not give promise of high yields.

79. Most of the food production companies are now contemplating the cultivation of paddy on the share system—offering to each individual cultivator from 5 to 10 acres of land. There is little doubt that this system of cultivation is better suited to the cultivation of paddy than is company effort, and if these tenants are carefully supervised and encouraged to adopt improved methods of cultivation and manuring, greatly increased crops of paddy can be realized.

80. Considerable extents of new land have been opened out by cultivators during the year, particularly in the Northern and Eastern Provinces, but there is evidence that in some parts such increases in areas of new lands opened have resulted in existing lands being abandoned. The acreage cultivated depends upon the labour available, and in many localities this acreage has reached its maximum for the system of cultivation adopted, and cannot be increased without the increase of the population by immigration.

81. The experience of the Government colony at Ratmale indicates that the immigration of individuals from a town population to the cultivation of paddy in jungle areas is not likely to be very successful, and it is evident that considerable immigration to paddy lands from town areas beginning to show some overcrowding is not likely to take place. There is undoubted evidence that overcrowding is beginning to become evident in several township areas, and unless industrial development is likely to take place upon a fairly considerable scale within a few years, special attention should be given to the rural aspect of education, with a view to providing prospective immigrants to agriculture a knowledge of rural life and its prospects.

82. This limiting factor of labour is a serious one in the question of increased paddy cultivation, and emphasizes the importance of securing increased crops from existing lands. By better attention to the selection of seed, the use of manures—particularly green manures—better ploughing, and in certain areas by transplanting, greatly increased crops can be secured, and it is in these directions that special efforts are being made. This question of the shortage of labour has naturally led to inquiries as to the use of machinery for the cultivation of paddy in Ceylon.

Agricultural officers in certain Provinces have directed particular attention to irrigation channels. The work of vel-vidanes is frequently very badly done, and requires much closer supervision. Increased provision has been made in the Estimates for 1921–22 for repairs to village irrigation works, and there is little doubt that greatly increased quantities of paddy could be secured if these village works were kept in good repair and the proper supervision of the work of vel-vidanes insisted upon. The question of the remuneration of vel-vidanes has been under consideration during the year with the Controller of Revenue and Revenue Officers. In some districts some dissatisfaction is felt. Cultivators do not feel that sufficient work is being done for them by the vel-vidanes. These complaints would disappear if adequate supervision of the work of vel-vidanes were provided for.

A careful study of the mechanical appliances used in other countries has been made, and some information regarding the experiments which are being carried out by the Government of the Netherland East Indies in Java has been secured. The results of these inquiries do not warrant an optimistic view being taken in regard to the possibilities of mechanical tillage or harvesting of paddy in Ceylon, and attempts in this direction must be considered to be purely experimental. More ploughing can be done in paddy fields by ordinary ploughs, but a plough suited to the small cattle and buffaloes of the country has still to be found, and a good deal of experimenting still remains to be carried out.

83. The cultivation of vegetables has considerably extended during the year, and the growth of manioc has increased. With the fall in the price of paddy there has been a corresponding decrease in the values of manioc, sweet potatos, and other tuberous crops. If this drop in price is considerable, a reduction in the acreages under these crops will eventually result.

84. Dry grain crops were not particularly heavy during the year owing to the shortage of rain, and in some areas, where chena permits had been reduced with the object of encouraging paddy cultivation, crops of these foodstuffs were considerably below the average.

Experiments with the growing of oats at Nuwara Eliya were made by the Forest Officer, and the results were decidedly encouraging. The year was a dry one, and therefore the ripening of the crop was satisfactory.

85. All Divisional Agricultural Officers and all Agricultural Instructors have paid particular attention to increasing food production, and details of their work in this connection will be found in Annexure VII.

86. An article on the food values of some Ceylon foodstuffs was prepared by the Government Agricultural Chemist and published in the "Tropical Agriculturist," Vol. LVI., No. 4.

Divisional Work.

87. In the Central Division, tobacco experiments have been carried out at Teldeniya, and various types of cigars manufactured for the local market. The tobaccos grown at Teldeniya have been reported to be too heavy and coarse for the English market and are likewise too heavy for Indian manufacturers. There is a demand locally for a cheap cigar, and a considerable improvement on the product at present marketed can be accomplished if the leaf is properly cured and selected. Some of the American varieties that have been experimented with have given satisfactory yields, and the smoking qualities of the manufactured product is now being tested. There is some evidence to show that the Mexican leaf is more generally favoured by cigar smokers, and trials are also being made with several well-known types of the tropical cigar tobaccos. The site for a small Experiment Station for the Matale District has been selected at Nalanda, and the tobacco work of the Central Division will be transferred to this station as soon as it has been established. The Mediwaka Chena experiment has been continued, and 27 plots of Cambodia cotton have been established by peasant cultivators from seed supplied free by the Department. Paddy manurial experiments were carried out during the maha season at eight centres, and more than sixty manuring and transplanting demonstration plots have been conducted by Agricultural Instructors in co-operation with cultivators. The Agricultural Instructor, Kegalla, has carried out a series of ploughing demonstrations with the Meston plough, and these demonstrations have stimulated interest in the possibilities of better cultivation in paddy growing. The stimulation of better cultivation by field competitions has been given special attention, and considerable interest has been shown by cultivators in these competitions which have been organized.

88. The Southern Division has been divided into eleven areas, and it is proposed to place an Agricultural Instructor in charge of each. At present nine Instructors are attached to the division. Special efforts have been made with competitions, both for paddy and vegetable growers, to induce better systems of cultivation. Progress has been made and keenness shown by several cultivators. Small Shows have also been held at various centres, and a larger Agricultural Show was held at Galle in the month of August. At this Galle Show, the Department of Agriculture arranged an Educational exhibit, which was of considerable value. The Divisional Agricultural Officer was responsible for much of the organization of this Show, and his efforts to interest cultivators in the exhibit made by the Department of Agriculture were appreciated. Transplanting of paddy is making progress in the Matara District. Paddy manurial experiments have also been carried out at five centres. The work at the Bandaragama and Weligama Experiment Gardens has been completely re-organized, and varietal trials with various food crops are now being systematically carried on. At Ambalantota and Kiula 60 acres of cotton have been planted out. The principal varieties sown have been Cambodia and American upland, but small trials are also being made with Indian, Egyptian, and Sea Island types. The growth of this cotton has been very promising, and there is little doubt that good crops can be grown in this section of the Colony.

89. The Northern Division contains three experiment stations, Anuradhapura, Jaffna, and Trincomalee. At Anuradhapura special attention has been given to the paddy selection work of the Economic Botanist. A further area of 65 acres was felled by prison labour, and 50 acres were burnt and sown with varieties of paddy. The work of prisoners has been good, but the outturn has not been so satisfactory as could have been hoped for. During the months of August and September bowel complaints were common, and during the latter part of the year a serious outbreak of malaria occurred. Careful statistics of the health of the prisoners have been kept, and there has been no greater an extent of ill-health among the prisoners used for agricultural purposes than amongst those employed upon other occupations at the Anuradhapura Jail. The total crop reaped from the area sown by prisoners has been 733 bushels. A gingelly crop will be sown early in 1922, and later in the year a beginning will be made with the *asweddumizing* of the land. This whole area will eventually be required for variety tests of the selected pure lines being made by the Economic Botanist. The area under fibres at Anuradhapura has been kept in good order, and plans have been drawn up for the erection of the requisite machinery for dealing with Sisal and Mauritius hemp. The area under limes has been fully supplied. Growth is so far very satisfactory. The small area of British Guiana limes established in 1917 fruited heavily during the year, and accurate details of yields have been kept. The oil palms continue to make progress, and annual yields continue to increase. The fruits are smaller than those of the West Coast of Africa. Samples have been sent to the Imperial Institute for analysis and report, and a full account of the experiments up to date is in course of preparation for publication.

90. Of the trials made with new food crops other than paddy, the best results were obtained from the varieties of cholam (*Sorghum vulgare*). These results have been tabulated in the "Tropical Agriculturist," Vol. LVII., No. 3, and were as follows :—

	Source.	Yields per Acre. Grain. lb.	Straw.
Anuradhapura.			
Millet gattara ..	.. Egypt	.. 480	.. 2,290
Millet ata ..	.. do.	.. 240	.. 1,190
Millet sabeini ..	.. do.	.. 360	.. 2,200
Pink Kafir ..	.. America	.. 420	.. 1,900
Dwarf Milo ..	.. do.	.. 1,260	.. 2,100
Dawn Kafir ..	.. do.	.. 660	.. 1,600
Feterita ..	.. do.	.. 960	.. 1,986
Jaffna.			
Feterita ..	.. America	.. 1,650	.. 16,200
Dwarf Milo ..	.. do.	.. 1,200	.. 11,500
Dawn Kafir ..	.. do.	.. 850	.. 19,200
Pink Kafir ..	.. do.	.. 900	.. 14,000

91. The experiments made at the Jaffna Station attracted considerable attention. Cholam is an important food crop over large tracts of India, and is also one of the most important fodder crops for cattle. The yields of straw at Jaffna have been double the Indian average, and in view of the great scarcity of fodder for cattle in Jaffna at certain times of the year, the growing of cholams—particularly the fodder varieties—offers considerable possibilities. The laying out of the Experiment Station at Jaffna was practically completed during the year, and two of the buildings of the Farm School, which is to be attached to this station, were completed. Work at Trincomalee has been handicapped by lack of sufficient funds, but the lay out of this small station, and proper provision for its irrigation will be completed during 1922.

92. In the Northern Division lectures have been given at various centres, demonstrations in ploughing conducted, and paddy manurial experiments carried out. As the result of this work, interest in the greater use of green manures for paddy has been evinced, and the tillage of coconuts begun. During the past three years a very great increase has taken place in the Jaffna peninsula in the use of Sunn hemp as a green manure for paddy. Its value is becoming to be realized. In many of the divisions large tracts of paddy lands are now regularly manured with this plant, and in others small trial areas are being cultivated. The Department has played its part in attracting the attention of cultivators to the value of this system of green manuring. Special attention to it is being given by all officers of the Northern Division, and it is at present one of the most important pieces of work in the interests of the peasant paddy cultivator. Trials with fish manures are also being made.

93. Agricultural Instructors in those parts of the Colony to which Divisional Officers have not as yet been appointed report direct to Head Office, and their activities are controlled by the Director of Agriculture. Extracts from their reports are attached. These officers have directed their attention during the year to fostering food production, stimulating better forms of cultivation, carrying out manurial experiments with paddy, fostering the transplanting of paddy, arranging garden and paddy field competitions, and assisting with Agricultural Shows and Co-operative Credit Societies. In the Ratnapura District three instructors have been acting, in addition to their own duties, as cultivation officers under major irrigation works. Steady progress is being made, but this cannot be rapid until further Divisional Agricultural Officers are appointed.

CO-OPERATION.

94. Annexure VIII. details the work carried out in connection with Co-operative Societies. This movement is making steady progress, but owing to depression in the rubber and plumbago industries, the repayment of loans in several districts is far from satisfactory. Continued efforts have been made to induce societies to make determined attempts to recover overdue loans, but progress in this direction is slow. Training classes were held for treasurers and secretaries of societies at ten centres during the year, and these were attended by 268 office-bearers of societies and 137 others interested in the movement. The instruction given at these classes was appreciated, and has resulted in some instances in better work being carried on. Two additional Inspectors were appointed during the year and sent to Madras for a period of six months' training. It will now be possible to inspect societies more frequently, and it is hoped that an improvement in the work done will be noticeable. The Co-operative Credit Societies Ordinance, No. 7 of 1911, was completely revised by the Legislative Council during the year, and copies of the New Ordinance, No. 34 of 1922, have been issued to all societies, together with a copy of Co-operative Leaflet No. 5, explaining the most important changes that have been effected. In the new Ordinance provision has been made for the appointment of Assistant Registrars and the Office Assistant to the Director, and the three Divisional Agricultural Officers have been gazetted in such appointments. Provision has also been made for the establishment of Central Banks, and the borrowing powers of all societies have been increased. The new Ordinance has been framed upon the latest Indian Act, and should greatly facilitate the co-operation movement. Manure supplies have been maintained, but several societies have fallen in arrears in regard to their payments. This has been brought about by reason of the purchase of manures at high prices during 1920 and by the considerable fall in the prices of paddy during the year 1921. The non-payment of accounts on due dates is being carefully watched, but this failure on the part of several societies and the slackness of several committees in enforcement of re-payment of loans to members on due dates has been to me and to co-operative officers the cause of very considerable anxiety during the year. Some societies are working excellently, and their office-bearers are taking great interest in the work. Others need very constant attention from supervising officers, while others, particularly in the Kandyan Provinces, rely either upon the sole efforts of the President or the Secretary, and need constant personal encouragement and stimulation by the Registrar.

95. I would welcome greater interest on the part of revenue officers in the work of co-operation. The Batticaloa Paddy Bank is an instance of what can be accomplished by official enterprise, while the Trincomalee Co-operative Credit Society, under the Chairmanship of the Assistant Government Agent, Trincomalee, has done most excellent work, and great credit is due to its Secretary, Mr. W. G. Vallipuram, Office Assistant to the Assistant Government Agent.

96. In all Provinces, except the Western, Southern, and the Northern, the village agricultural population still looks to the revenue officer and his headmen for assistance, guidance, and encouragement. If the headmen are encouraged by revenue officers to assist the co-operative movement, much can be done, for trained supervising officers are now available, and these officers are anxious to assist in the working of societies. Their duties are not confined to audit and inspection.

97. The defalcation in the Dakunu Talangama Co-operative Society is recorded with regret. It is the first defalcation in any society, and was rendered possible by slackness on the part of office-bearers and committee members.

AGRICULTURAL EDUCATION.

98. The Divisional Agricultural Officer, Central, was made Vice-Principal of the School of Tropical Agriculture at Peradeniya. The report of this school shows that satisfactory progress has been made, and that the development of the practical work of the school has made progress. His Excellency the Governor opened the new buildings for the school in September, and, subsequently, inspected the whole of the school and of the land attached to it. Lady Manning kindly distributed the prizes and certificates to the students who completed their course in March, 1921. His Excellency the Governor promised an annual prize to the school—a promise that was greatly appreciated by the Department and by the *alumni* of the school.

The new buildings of the school of Tropical Agriculture at Peradeniya were completed during the year. Adequate housing accommodation for the staff and for students has been provided, and suitable lecture rooms and laboratories built.

The work of organizing this school has been carried out by Mr. St. L. H. de Zylva, and now that it has been decided to place agriculturally-trained officers in charge, I desire to place on record my appreciation of work done by this officer. Mr. de Zylva proceeded on leave, with effect from January 1, 1922, preparatory to taking up teaching at St. Thomas's College, Mount Lavinia.

A beginning has also been made with the buildings for the proposed Agricultural School at Jaffna, and, pending the completion of these buildings, arrangements were made for a series of lectures on Agricultural matters at various centres.

99. School gardens attached to elementary schools have received special attention, and have been thoroughly inspected. The work in the school gardens of the Kalutara, Matara, Kurunegala, and Kegalla Districts deserves special mention. The work has been handicapped to some extent during the past few years by want of sufficient implements, and it is satisfactory to record that the Legislative Council has sanctioned a considerably increased item under this head of expenditure during the financial year 1921–22 to make good supplies which could not be obtained during the war period.

100. The number of Government vernacular schools at which School Gardens have been registered now totals 443. A total of Rs. 2,030 monetary awards and 209 certificates were granted during the year. Home Gardens attached to the gardens of pupils of elementary schools are also maintained, and to these monetary awards and certificates were issued. The awards were as follows :—

District.		Number of registered School Gardens.	Number of Certificates granted for good Work.	Number of Monetary Awards made.	Number of Home Garden Certificates granted for good Work.	Number of Monetary Awards made to Home Gardens.
Central Agricultural Division	Kandy	55	18	16	3	3
	Nuwara Eliya	15	7	4	2	2
	Matale	16	2	1	—	—
	Kegalla	30	9	9	2	2
Southern Agricultural Division	Kalutara	39	21	16	3	3
	Galle	27	12	11	—	—
	Matara	29	19	12	4	4
	Hambantota	21	11	9	2	2
Northern Agricultural Division	Anuradhapura	22	9	9	8	8
	Mannar	3	2	2	—	—
	Mullaittivu	5	1	1	—	—
	Trincomalee	2	1	1	—	—
	Colombo	42	16	15	10	10
	Kurunegala	55	48	28	16	16
	Puttalam	8	8	7	6	6
	Chilaw	9				
	Ratnapura	30	12	11	—	—
	Uva	25	7	6	3	3
	Batticaloa	10	6	3	2	2
	Total	443	209	161	61	61

101. The School Gardens in the Colombo District are in need of improvement, and special efforts in this direction will be made.

102. Mr. D. H. Grist, Agricultural Instructor, Department of Agriculture, Federated Malay States, was on deputation to Ceylon during the months of February and March, 1921, to study and report upon the work of the Agricultural School and of School Gardens. He was impressed by the solid work being done in this Colony, and has recommended to the Government of the Federated Malay States the adoption of a similar policy.

Botanic Gardens.

103. Annexure IX. gives details of the work of Botanic Gardens. At Peradeniya, extension of the section devoted to Conifers has been undertaken by the Curator, and 66 additional plants from Peradeniya, Hakgala, and the Seminary, Kandy, have been planted out. A very considerable improvement of the South Garden has been affected thereby. The flower garden has also been extended and rounded off to the end of the Palmyra avenue, while the improvement of the Arboretum has continued to receive attention. More room has also been given to the bamboo collection, and seven new palms were added to the Palmetum. The Curator devoted some attention to the budding of Hevea rubber during the year, and was able to secure success in the month of September. Ten dozen roses were obtained from Messrs. Hackett, Limited, Adelaide, and were planted out during the year. The year was abnormally dry one—rainfall being 22 inches below normal. This resulted in the flowering and fruiting of a very large number of trees and shrubs, and many specimens which had not previously flowered or fruited at Peradeniya did so during the year. Advantage was taken of the Superintendent of Botanic Gardens being on leave to obtain new plants for the Gardens. Five wardian cases of plants were secured and brought back by Mr. Macmillan. An effort was made to secure rock-loving plants for the new Rockery at Hakgala, but very few of these survived the journey. However, several interesting additions were made to the Peradeniya collections. Efforts have been made to improve the nurseries of the Royal Botanic Gardens, Peradeniya, and to replace overgrown nursery stock.

104. At Hakgala attention has been largely directed to the establishment of a Rockery and Water Garden. The advances that have been made in Europe in recent years in Rock Gardens made it appear to be desirable that attempts should be made to establish a suitable Rockery in Hakgala and to acclimatize several of the more important rock-loving plants. A beginning was made in 1920 above the Nock Memorial, but a much better site near the camphor plantation was selected by the Curator, and an interesting collection of plants has been put out. This extension of the Garden should form an addition which should be of value to the amateur gardener as well as to the professional botanist. The new flower garden has developed satisfactorily, and is a marked improvement to the Gardens. A new collection of roses has been obtained, but has not done as well as could have been hoped for. A greater portion of the fernery was completely overhauled, and nursery stocks have been increased. Improvements have also been effected in the Garden at Nuwara Eliya.

105. At Henaratgoda steps have been taken for planting up areas of grafted mangoes and of selected coconuts. A list of plants growing in the Gardens has been prepared by the Assistant Curator, and is under revision.

106. New collections of roses has been obtained for Cuddesdon, and extensions made to the vegetable garden at Queen's Cottage.

Seed Distribution and Publications.

107. Annexure X. gives briefly the details of the work of the Central Seed Store and Publication Depôt. Much of the work previously undertaken by the Ceylon Agricultural Society has been absorbed into this branch of the Department. Members of the Agricultural Society continue to receive their requirements from the Department, pending the commencement of operations by the new Agri-Horticultural Society in Colombo.

108. The following publications were issued during the year :—

The "Tropical Agriculturist," Vols. LVI. and LVII.
The "Govikam Sangarawa," Vol. XV.
The "Kamat Tholil Velakkam," Vol. XVI.
Annals of the Royal Botanic Gardens, Peradeniya, Vol. VII., Part III., October, 1921. Studies in Entomogenous Fungi by T. Petch.

Bulletins of the Department of Agriculture.

No. 48.—Summary of Laws and Regulations in Force in Ceylon in respect of Plant Pests and Diseases.
No. 49.—The Cultivation of Limes.
No. 50.—The Cultivation of Pineapples in Ceylon.
No. 51.—Notes on the Efficacy of Formaldehyde Vapour as a Disinfectant.

Leaflets.

No. 12.—Brown Bast—Revised Edition.
No. 18.—The Bunchy Top Plantain Disease (English, Sinhalese, and Tamil).
Co-operative Leaflet No. 5.

Posters.

Shot-hole Borer (English, Sinhalese, and Tamil).
Paddy Fly (English, Sinhalese, and Tamil).

General.

109. The Director of Agriculture was nominated by His Excellency the Governor an official nominated member of the Legislative Council with effect from May 26, 1921. He was placed in charge of the Ordinances consolidating and amending the Co-operative Credit Societies and relating to the Department (and Board) of Agriculture. He was a member of the Committee of Council to report on the relief that could be afforded to the rubber industry and to the Commission appointed to consider the Forest Ordinance and the future forest policy of the Colony.

110. The Director of Agriculture was nominated during the year a member of the Council of the University College, and represents agricultural education on its academic committee. He was also a member of the committee appointed to consider the training of teachers.

111. Conferences to decide upon the relationship between the Agricultural and Veterinary Departments were attended, and the proposals submitted by the Department that the Department of Agriculture should become responsible for cattle breeding, while the Veterinary Department should be responsible for cattle diseases and quarantine, were eventually accepted by the committee.

112. The conference held by the Controller of Revenue to decide upon those irrigation works and agricultural roads which should be taken up by Government in the interest of food production was also attended, and the future policy in regard to sales or leases of lands, water rates, &c., were discussed.

113. The meeting of the statistical council was attended, and the lines upon which agricultural statistics should be secured were considered with the Director of Statistics. A beginning with a Census of Production was made, and returns secured for the tea, rubber, coconut, and paddy industries. Assistance was also given in the preparation of the economic sections of the Colony Handbook of Standing Information.

114. Dr. J. C. Hutson, Entomologist, represented the Colony at the Fourth Entomological Conference at Pusa, and was absent on this special duty from February 1 for a period of fifteen days.

115. Mr. G. G. Auchinleck, Divisional Agricultural Officer, Southern, was deputed for special duty to the Seychelles at the request of the Secretary of State for the Colonies, with effect from October 11. He has been entrusted with reporting upon the Economic Resources of the Seychelles and with inquiries into the coconut and vanilla industries of that Colony.

Alcohol.

116. The question of the production of power alcohol has been further considered. A report was drawn up on this question by the Director of Agriculture and the Government Analyst. After examining the various sources of power alcohol in the Colony, the conclusion was come to that the cultivation of sugar-cane gave promise of the greatest success if use could not be made of the cellulose of coir-fibre, and dust. Two independent inquiries have been made during the year by representatives of power alcohol concerns. Copies of this report have been provided to them, and their inquiries assisted as far as possible.

Expenditure.

117. The following is a statement of expenditure for the financial year 1920-21 :—

	Rs.	c.
Salaries (including Head 3, Clerical Service)	185,949	91
Annual Grant to the Ceylon Agricultural Society	64,372	56
Travelling	31,569	7
Gardens—Labour and Upkeep :—		
Peradeniya Gardens	20,766	23
Hakgala Gardens	6,957	95
Henaratgoda Gardens	3,058	38
Nuwara Eliya Gardens	1,998	29
Queen's House Gardens	1,598	49
King's Pavillion Gardens	3,797	63
Queen's Cottage Gardens	5,128	40
Temple Trees Gardens	1,027	43
The Lodge Gardens	667	53
Cuddesdon Gardens	834	85
Nursery Work in Colombo	640	39
Experiment Stations :—		
Peradeniya	31,690	34
Anuradhapura	17,742	97
Chilaw Coconut Trial Ground	2,466	61
Jaffna	11,137	38
School Gardens :—		
Labour and upkeep	5,985	58
Upkeep of library, laboratories, &c.	7,395	3
Prevention of plant pests and diseases	827	31
Incidental expenses	3,649	0
Stationery	2,826	96
Printed forms	458	62
Binding	90	0

	Rs.	c.
Agricultural Education :—		
Salaries	7,820	50
Scholarships to India	4,159	39
Travelling	379	38
Lecturing fees	1,102	0
Incidental expenses	839	19
Rent of quarters	435	0
Stationery	91	41
Laboratory expenses for School of Tropical Agriculture	514	19
Labour and upkeep of Irene House property	2,532	80
Dieting of students	9,249	57
Co-operative Credit Societies :—		
Salaries	5,581	67
Training of two Inspectors	1,164	52
Training of Secretaries	1,099	25
Travelling	3,101	49
Incidental expenses	185	70
Stationery	179	4
Special Expenditure :—		
Experimental cultivation of tobacco	6,229	65
Seed distribution	—	
Grants in aid for agricultural shows and competitions	3,603	88
Local production of castor oil	—	
Experimental cultivation of cotton	3,016	87
Total	463,922	41

This expenditure may be itemized under the following sub-heads :—

	Rs.	c.
Administration	54,683	10
Research : Scientific investigations, including Central Experiment Station	128,645	60
Botanic Gardens, including Gardens of Governor's and Colonial Secretary's Residences	77,777	32
Agricultural Education, including School of Tropical Agriculture, School Gardens, Grants to Shows, and Competitions and Annual Grant to the Agricultural Society	106,849	74
Divisional Experiments, including Special Expenditure on Tobacco Cultivation, Experimental Cultivation of Cotton, and Experiment Stations in Jaffna, Anuradhapura, and other minor experimental plots	84,654	98
Co-operative Credit Societies	11,311	67
Total	463,922	41

RECEIPTS.

118. The following is a statement of receipts collected during the year :—

		Rs.	c.
1.	Head Office	699	21
2.	Royal Botanic Gardens, Peradeniya	2,160	64
3.	Botanic Gardens, Hakgala	794	91
4.	Botanic Gardens, Henaratgoda	370	10
5.	Botanic Gardens, Nuwara Eliya	25	75
6.	Experiment Station, Peradeniya	12,200	0
7.	Experiment Station, Anuradhapura	333	10
8.	Tobacco Trial Ground, Jaffna	34	4*
9.	Experiment Station, Trincomalee	38	62
10.	School of Tropical Agriculture	10,757	73
11.	Central Agricultural Division	390	29
12.	Southern Agricultural Division	207	55

* The value of tobacco sent to the Crown Agents for sale is not included.

To this must be added the value of seeds and plants issued gratis to Government institutions from the following :—

	Rs.	c.
Peradeniya Gardens	1,043	30
Hakgala Gardens	381	10
Henaratgoda Gardens	12	0
Experiment Station, Peradeniya	136	81
Nuwara Eliya Gardens	45	0
Experiment Station, Trincomalee	17	50
Southern Division	8	34

COMMUNIQUÉS.

119. The following *communiqués* were made to the press on matters of agricultural importance and interest during the year :—

Lime as a Treatment for Tea Tortrix.
School and Home Garden Awards, 1920–21.
Plant Pest and Disease Inspectorate Work.
Robusta Coffee in the Ratnapura District.
Agricultural Competitions in the Galle District.
Lime Cultivation in Ceylon.
Pineapple Cultivation.
Agricultural Competitions in the Galle District.

STAFF CHANGES.

120. It is with regret that I report the death on December 28, 1921, of Mr. P. B. Herat, Office Assistant to the Department. Mr. Herat performed good service in the Department, and was extremely useful to it in regard to all legal questions involved in the administration of the Co-operative Credit Ordinance and of the regulations relating to Plant Pests and Diseases.

The following staff changes took place during the year :—

(1) Mr. T. Petch, Botanist and Mycologist, who was on leave in England, returned to the Island, and resumed duties on April 14.

(2) Mr. F. Summers, Economic Botanist, resigned his post from February 20. He was succeeded by Mr. R. O. Iliffe on April 12.

(3) Mr. H. F. Macmillan, Superintendent of Botanic Gardens, who was on leave in England, returned to the Island, and resumed duties on July 21.

(4) Mr. N. K. Jardine, Inspector of Plant Pests (Central), left for England on leave on July 20.

(5) Mr. F. Burnett assumed duties as Divisional Agricultural Officer on August 23.

(6) Mr. A. T. Reeve assumed duties as Inspector of Plant Pests (Southern) on October 1.

(7) Mr. M. Park, Assistant Mycologist, was seconded for service under the Rubber Research Scheme, and assumed duties on October 13.

(8) Mr. G. G. Auchinleck, Divisional Agricultural Officer (Southern), left for Seychelles on special duty on October 11, Mr. F. Burnett acting.

(9) Mr. G. E. J. Hulugalle, Assistant Manager, Experiment Station, Peradeniya, left for Cambridge for higher training on September 1.

The following appointments, changes, and retirements took place during the year in the Clerical, Agricultural, Research, and Field Staffs of the Department :—

(*a*) *Appointments : Clerical.*—Messrs. A. B. Suriyadasa and M. Perera, with effect from January 1. M. D. H. Perera from July 1.

Agricultural Branch.—Messrs. G. V. Wickremesekera and J. A. Alles, who were sent to India for a post-graduate course at the Agricultural College, Poona, returned on May 21. Mr. Wickremesekera was appointed as Lecturer at the School of Tropical Agriculture, Peradeniya, and Mr. Alles as Assistant Manager, Experiment Station, Anuradhapura, with effect from October 1. Messrs. N. Senathiraja and

N. Senaratne, who were sent to Coimbatore and Poona for training, were appointed Assistant Farm School Officers from January 1 and June 29, respectively. Messrs. M. Amerasinha and S. B. Yatawara, who were sent to Madras for training, were appointed Inspectors of Co-operative Societies of the Southern and Central Divisions from December 1. Messrs. K. Arumugam, V. Canagaratnam, and E. W. Dias Bandaranayaka as Instructors from December 1.

Research Branch.—Mr. E. J. Livera, B.Sc., as Assistant in Systematic Botany from January 1. Mr. H. Ludowyke as Librarian from September 15. Mr. B. A. Pereira as Sub-Inspector, Plant Pests, from October 1. Mr. G. L. de Silva as Draughtsman from December 1. Mr. C. Ragunathan as Assistant in Mycology from October 1.

Field Branch.—Messrs. B. A. de Alwis and K. M. B Ranasingha as Upper Gardeners from October 1.

Changes : Clerical.—Messrs. E. P. Chelliah and W. L. P. Amerasinghe were transferred from the Food Production Department, with effect from April 1 ; Mr. K. Paramanathan from the General Treasury was transferred to this Department from April 1, *vice* Mr. L. V. S. W. Jayawardena ; Mr. A. S. Samaraweera from Kurunegala Kachcheri from October 1, *vice* Mr. L. J. de S. Mihiripenna dismissed. The following clerks from the Ceylon Agricultural Society were transferred to this Department from October 1 :—Messrs. W. A. W. Goonewardena, C. A. Samarasinha, K. B. Halangoda, W. E. Weeratna, P. B. Seneviratne, K. R. Samaratunga, and A. P. Wijenarayana.

Agricultural Branch.—Mr. M. B. Wettewe, Agricultural Instructor, was appointed Ratemahatmaya, Nadukadu pattu, from November 15. He was succeeded by Mr. George Madugalle. Mr. A. M. Muttukumaru was transferred to the Northern Division as Tamil Inspector, Co-operative Societies, from December 1. The following transfers took effect from October 15 :—Mr. A. Madanayake as Agricultural Instructor, Ratnapura, and Inspector of School Gardens, South-Western Division ; Mr. L. A. D. Silva as Agricultural Instructor, Elpitiya ; Mr. J. C. Abeywardena as Agricultural Instructor, Pasdun Korale east. Mr. P. B. Kapuwatte was transferred as Agricultural Instructor, Godakawela, from November 30.

Research Branch.—Mr. L. S. Bertus, who was sent to Pusa for training, returned on August 8, and resumed duties as Field and Laboratory Assistant to the Botanist and Mycologist.

Field Branch.—The following changes in the Royal Botanic Gardens, Peradeniya, took effect from October 1 :—Mr. K. J. A. Sylva as Foreman ; Mr. M. J. Fernando as Foreman of Economic Nurseries and Supplies to School Gardens ; Mr. W. de Alwis as Senior Assistant Foreman ; Mr. D. W. K. Goonewardena as Second Assistant Foreman ; Mr. A. Jayasinha as Third Assistant Foreman ; Mr. T. de Silva as Second Upper Gardener ; Mr. E. Perera as Foreman, Hakgala Gardens ; Mr. P. J. Christoffelsz as Head Gardener, Queen's Cottage, Nuwara Eliya ; Mr. P. B. Kiridena as Nurseryman, Hakgala ; and A. D. Arnolis as Ninth Gardener.

Retirements.—Mr. St. L. H. de Zylva, Registrar, School of Tropical Agriculture, Peradeniya, left the Department at the end of the year consequent upon abolition of the post. W. M. Mudiyanse, Gardener, Queen's House, Colombo, resigned his appointment on November 15 ; D. de Silva, Gate Arachchi, and Villapathra, Gardener, retired from the service from October 1. Mr. R. S. Pelpola, Agricultural Instructor, resigned his appointment on December 31.

Ranks.—The rank of Muhandiram was conferred on Mr. N. Wickremaratne, Secretary of the Board of Control, Co-operative Credit Societies, at the Levee held at Queen's House, Colombo, on June 3, 1921.

VISITORS.

121. Several distinguished scientists called at the headquarters of the Department during the year in regard to special inquiries being carried out by them. Special facilities were afforded to them to obtain the necessary information required. Amongst those that reported at the Head Office may be mentioned the following :—

Dr. Robert Pendleton, Director of Agriculture, Gwalior.

Dr. Fumio Marno, Agricultural Chemist, Government Tea Experiment Station, Japan.

Dr. R. Kanehira, Director, Experiment Station and Botanic Garden, Formosa.

Dr. J. V. Danes, Professor, Prague University.

Professor S. R. Bosé, Professor of Botany, Medical College, Calcutta.

Professor S. K. Mukerji, Professor of Botany, Lucknow.

CONCLUSION.

122. The year has been a strenuous one for all branches of the Department. New organization was given effect to, and new pieces of work taken up by all divisions. Throughout I have had the loyal co-operation of all officers, and everyone has given of his best for the agriculture of the Colony. The salaries paid to officers of the Department compare most unfavourably with those paid to officers performing similar work in other Agricultural Departments of the East. The Salaries Commission recognized the inadequacy of existing salary scales, and recommended improved scales comparable with the scales of salary in force elsewhere. A beginning has been made with the housing of officers at Headquarters, and it is hoped that this policy will be continued, and that increases to salaries will not be long deferred. Otherwise, officers of experience must necessarily look to those countries which will provide them with a living wage.

April 17, 1922.

F. A. STOCKDALE,
Director of Agriculture.

Annexures.

I.—REPORT ON THE WORK OF THE DIVISION OF BOTANY AND MYCOLOGY.

MYCOLOGY.

MYCOLOGICAL specimens sent in for examination during the year numbered 684. Of these, 197 were Hevea, 178 tea, 13 coconut, and 132 fungi, chiefly from rubber and tea. The remaining specimens included acacia, albizzia, bandakkai, betel, brinjal, cacao, *Canavalia ensiformis*, canna, cardamoms, cedrela, chilli, coca, coffee, colocasia, cotton, crotalaria, dadap, eucalyptus, ginger, grevillea, groundnut, guava, mango, orange, paddy, papaw, pineapple, plantain, sorghum, sugar-cane, tephrosia, tobacco, tomato, and miscellaneous garden plants.

Visits have been made by the staff to the Kelani Valley, Ratnapura, Hambantota, Galle, Polgahawela, Undugoda, Rambukkana, Ambepussa, Giriulla, Kurunegala, Negombo, Puttalam, Trincomalee, Moneragala, Bibile, Matale, Kelebokka, Galagedara, Dolosbage, and Lindula districts.

RUBBER.

Diseases of Hevea were less in evidence during the past year. The irregular rainfall of the south-west monsoon was not favourable for the development of leaf fall and pod disease, and though this disease occurred in some districts, there was no general outbreak.

Root diseases continue to give trouble, and accounted for slightly more than half the total of Hevea specimens submitted for examination. Of these, 43 per cent. were *Fomes lignosus*, 41 per cent. brown root disease, 11 per cent. Ustulina, and 3 per cent. Poria. A number of other cases of *Fomes lignosus* are included among the fungi submitted for examination. Two cases of a root disease, which is probably caused by a Xylaria, were recorded; this disease was first noted in 1909, when a single case occurred, but it had not been observed since.

Complaints of "rust" on smoked sheet have been fairly common, but, in some instances at least, this was not the appearance which has hitherto been known as rust. The market is apparently applying the old term to a new supposed defect, *i.e.*, to rubber on which a mark can be made by scratching it with a rough instrument. In many cases this is not due to the formation of the surface film hitherto known as rust, and it appears that in these the actual rubber is abraded or torn by this test. Whether this denotes some defect in the manufacture has not yet been determined.

TEA.

Red rust (*Cephaleuros*) which has been prevalent in certain districts for the last two or three years was especially prominent in the Ratnapura District during 1921. A lecture on this subject was given to the Sabaragamuwa Planters' Association, and was fully reported in the local press. It is generally held that red rust is a disease which is only serious on weak bushes, and that among the causes of weakness of the bushes are poverty of the soil and overplucking. The cessation of manuring during the period of the war, coupled in some cases with hard plucking at the same time, has probably been the chief contributing factor to the present occurrence of this disease.

Several cases of the leaf disease of tea caused by *Cercosporella Theæ* were recorded during the wet seasons, nearly all from up-country estates. This disease is now known to occur in the Uda Pussellawa, Lindula, Agrapatana, Maskeliya, Ramboda, Pundalu-oya, and Hunasgiriya districts. In almost all cases, this disease begins on acacia, and spreads from the acacia to the tea. The acacias are defoliated, and the falling leaflets convey the disease to the neighbouring tea, in addition to the more normal distribution of the fungus by means of wind-blown spores. *Acacia decurrens* is the species most usually concerned, but that is merely because it is the one most generally planted; the fungus can also attack *Acacia dealbata* and *Acacia melanoxylon*. Several cases have been recorded in which the disease has occurred in firewood reserves on *Acacia decurrens*, and has spread from that plant to red gum (*Eucalyptus robusta*) and karri (*Eucalyptus diversicolor*). The disease does not appear to originate on red gums and spread from them to tea. The occurrence of this disease invites consideration of the advisability of planting acacias through tea.

Branch canker on young stems caused by *Macrophoma theicola* has been fairly common. This may be attributed to the same cause as red rust, *i.e.*, cessation of manuring.

PLANTAINS.

Mr. G. Bryce, Assistant Botanist and Mycologist, is investigating the diseases of plantains, and has furnished the following report :—

Reports from various districts indicated the spread of the disease known as bunchy top, which is characterized by the dwarfing of young suckers. Such diseased suckers sooner or later die off without producing fruit. With any considerable increase in incidence of the disease, there would, therefore, be a serious diminution in the production of an important foodstuff. The disease first appeared in the Colombo District in 1913, and is now found in addition in Panadure, Horana, Rambukkana, and in the Central Province up to 3,000 feet. In 1918 a plot of Manila hemp at the Peradeniya Experiment Station was practically destroyed by it.

The roots and corms of affected plants are diseased, and a *Rhizoctonia* is commonly present on them, particularly on the roots. Nematodes are occasionally present, and give rise to typical root galls. The *Rhizoctonia* has not as yet been obtained in pure culture, and the evidence available is not complete enough to attribute the disease solely to this fungus. The disease is worst in fields which have been allowed to run on for several years from the date of planting. Recently-planted fields are comparatively free of the disease; where diseased stools occur in them it is probable that they are for the most part due to inadvertent planting of diseased suckers. Treatment may be summed up as (1) more frequent replanting of fields with carefully selected suckers, and (2) destruction of diseased plants. Potash manures have been found effective in combating both *Rhizoctonia* in jute and bunchy top in plantains, and, where possible, it is advisable that similar treatment should be adopted here.

Coconuts.

The following notes have been contributed by Mr. C. H. Gadd, Assistant Mycologist, who is engaged upon the investigation of coconut diseases :—

Coconut diseases in general have been less prevalent during the year owing to the drier climatic conditions being less favourable to fungus growth. No new disease has become prominent, nor have any of the known diseases become more conspicuous during this period.

Nut fall and leaf droop still continue to attract attention in the Kurunegala District. Further observations on these diseases indicate that physiological causes may produce symptoms similar to those caused by the direct attack of the fungus *Phytophthora* sp. The removal, for any cause, of a leaf supporting a bunch of nuts is usually followed by a fall of those nuts owing to the nut branch (spadix) breaking. The fallen nuts, if immature, rapidly blacken at the stalk end and so resemble *Phytophthora*-attacked nuts. The drooping of the leaf is equivalent to its removal, and for this reason palms affected by leaf droop appear to be affected by nut fall also. The exact conditions which lead to the physiological form of these diseases have not been accurately determined, but the disease has been reported from several places as following directly upon the drought of the earlier part of the year. The fall of nuts consequent on drought has been long known, but the drooping of leaves from this cause has not been recorded. It should be noted that an excess of water in the soil reacts upon the coconut palm in a way similar to drought. It is, therefore, to be expected that deep draining in the wetter, low-lying parts of the Kurunegala District will have a beneficial effect on these diseases.

Experiments to determine the efficacy of Bordeaux mixture as a preventative of nut fall showed that no benefit was derived from spraying in 1921 ; this was no doubt due to the non-appearance of the organism (*Phytophthora* sp.) owing to the drier climatic conditions. The experiments, however, showed that of the total number of nuts removed from the palms during the year, 53·3 per cent. fell before passing the age of two months, and the fall of these was probably due to natural causes ; 44 per cent. were picked ; the remaining 2·7 per cent. fell at a more or less advanced stage of growth, but immature.

A few cases of bud rot have been investigated during the year. One case in the Negombo District demonstrated the very virulent nature of this disease, under suitable conditions, amongst young palms. The necessity for the immediate destruction by fire of palms affected by this disease cannot be too strongly emphasized.

The removal and destruction of the parts of leaves affected by leaf break disease or die-back has proved to be efficacious in keeping this disease in check.

No organism has been found to be constantly associated with the "taper stem" disease of coconuts. Examination of affected palms shows the stem and crown to be healthy, though the leaves are dwarfed. In the absence of an active organism at the root, unsuitable soil conditions or malnutrition would appear to be the main causes of the disease. Where a palm is badly affected, only in rare cases would remedial treatment be worth while, for if the treatment were effective there would always be a constriction in the stem where it had originally tapered, and with the palm again carrying a heavy crown, the liability of the stem breaking at this point during a storm would be great.

Phytophthora Diseases.

Mr. Gadd, who has the Ceylon species of *Phytophthora* under investigation, writes :—

From a diseased specimen of *Dendrobium Maccarthiæ* sent to the laboratory for examination, a species of *Phytophthora* was isolated and grown in culture alongside the *Phytophthora* isolated from rubber pods. It was found this *Phytophthora* agreed closely in cultural details with that from rubber pods, and, moreover, readily infected rubber pods, causing a rot similar to that so well known on many estates. These Phytophthoras must be regarded as the same species.

Another *Phytophthora*, causing a soft rot of papaw fruits, was isolated from specimens obtained from the Botanic Gardens, and was grown in culture alongside those obtained from cacao and rubber pods. In culture these fungi are very similar, and no ready means of distinguishing the one from the other was found. Cross infection experiments were started, and it was found that the strains from cacao and from rubber would infect papaw fruits, but not so virulently as would the strain from papaw. For the present, therefore, these three fungi must be regarded as the same species, viz., *P. Faberi* Maubl.

Another species of *Phytophthora* somewhat resembling *P. Meadii* McRae, which causes leaf fall and pod rot of *Hevea* in Southern India, was isolated from diseased fruits of Nam Nam (*Cynometra cauliflora*). This fungus readily produced oospores in culture, and in this respect differs from the species usually found on rubber and cacao pods in Ceylon. Infection experiments with this fungus on rubber pods failed, and therefore this species is probably to be regarded as distinct from *P. Meadii*.

Coffee.

Die-back attributed to *Colletotrichum incarnatum* occurred on *Coffea robusta* on the Experiment Station and elsewhere.

With accession of assistance in the Mycological Division, it has been possible to take up several investigations which have long been overdue. Mr. C. Ragunathan, Field and Laboratory Assistant, has carried out systematic field and microscopical examinations on the leaf disease of coffee (*Hemileia vastatrix*), with the surprising result that the teleutospores, which had only been seen by two observers previously, were found in 1921 practically at all times of the year.

Cacao.

Several root diseases of cacao are under investigation. In addition to the usual species of *Cephaleuros*, *C. minimus* Karst, has been found on "Die-back" branches of cacao.

Pestalozzia.

Mr. L. S. Bertus, Senior Field and Laboratory Assistant, returned from Pusa on August 8, and began the investigation of the species of *Pestalozzia* which occur on tea, coconut, &c., in order to determine whether the gray blights of these plants are identical or not. This work is still in progress, but the results so far obtained indicate that the *Pestalozzia* on tea is not the same as that on coconut.

MISCELLANEOUS.

New diseases recorded during the year include black rot (*Corticium* sp.) on coca (*Erythroxylon Coca* L.); wilt of brinjals (*Solanum Melongena* L.) caused by *Bacillus solanacearum* E. F. Sm.; Collar rot of sugar cane caused by *Hendersonina Sacchari* Butl.; *Acrothecium lunatum* Walker on *Sorghum*; bacterial disease of cannas; *Cladosporium* sp. on *Setaria italica* Beauv.; *Sphærella citrullina* (C. O. Sm.) Gros. on *Luffa acutangula* Roxb.

BOTANY.

365 specimens of flowering plants were received for identification. Various indigenous seeds and plants were identified for Colombo firms with a view to their commercial exploitation. Five specimens were identified for the Forest Department. Seeds of *Chenopodium ambrosioides* were collected for extraction of the oil for analytical examination. Advice was given to the Salt Department with regard to plants for protection of bunds, and an officer was deputed to determine what plants were growing in the neighbourhood of the salt pans and to point out to the Superintendent those which were suitable for the purpose.

The weed *Acanthospermum humile* DC., recorded first from the Colombo District in 1916, was collected in the Puttalam District by Mr. F. Lewis. Several weeds reported to be giving trouble on estates proved to be indigenous plants; among these were *Drymaria cordata* Willd. on an up-country estate, and *Spermacoce ocymoides* Burm. f. in the low-country.

The water hyacinth is still common in the Tangalla district, and has reappeared in its old locality near Kandy.

Bromelia pinguin L., which was introduced into Ceylon before 1867, has become naturalized, and is now spreading in the Negombo District, where it is being employed as a hedge plant.

Identifications were made of the leguminous weeds, *Cyperaceæ*, and *Gramineæ*, found in paddy fields at Anuradhapura in connection with the paddy fly investigations.

A new species of orchid was found by Mr. A. N. Paine in the Maturata district.

The staff of the division undertook the supervision and supply of specimens for the practical examinations in Botany of the London University during the year.

Mr. E. J. Livera, Assistant in Systematic Botany, has made several collecting tours, and has assisted in the identification of the specimens sent in.

PUBLICATIONS.

One number of the Annals of the Royal Botanic Gardens has been published during the year, containing a paper entitled "*Studies in Entomogenous Fungi, II.: The Genera Hypocrella and Aschersonia*," by T. Petch. This is a monograph of these two related genera, and deals with all the species which have been recorded. It forms part of a series of papers on the fungi which are parasitic on scale insects, the use of which for the control of these insects is periodically proposed by those who have not studied the subject.

Other publications written by the staff of this division during the year are—

Brown Bast, by T. Petch, Leaflet No. 12 (revised).

Bunchy Top Disease of Plantains, by G. Bryce, Leaflet No. 18.

The Efficacy of Formaldehyde Vapour as a Disinfectant of Tea Seed, by C. H. Gadd, Bulletin No. 51.

A Preliminary List of the Diseases of Cultivated Plants in Ceylon, by the Staff, Bulletin No. 52.

The Disinfection of Tea Seed, by the Staff.

T. PETCH,
Botanist and Mycologist.

January, 1922.

II.—REPORT ON THE WORK OF THE ENTOMOLOGICAL DIVISION.

REPORT OF THE ENTOMOLOGIST.

CONSIGNMENTS of specimens received during the year numbered 215, and include insect pests from all the more important crops and from miscellaneous plants.

During 1921 the Entomologist visited estates in the following districts:—Dumbara, Hunasgiriya, Matale, Pussellawa, Haputale, Nuwara Eliya, Maturata, and Passara.

Two visits were paid to the Eastern Province to investigate coconut pests, and the Dry Zone Experiment Station, Anuradhapura, was visited twice in connection with paddy fly investigations. Visits were paid to plantain cultivations in the Kegalla, Rambukkana, and Alawwa districts, in company with the Assistant Mycologist, to investigate plantain pests and diseases.

FUMIGATORIUM.

During the year 230 cases of tea seed, 796 cases of oranges, and 432 packages of plants and seeds have been treated at the fumigatorium in Colombo.

A fumigation box has been installed at the fumigatorium during the year to deal with the numerous small consignments of plants.

The Entomologist paid two visits to the fumigatorium during the year.

Pests in 1921.

Tea.

Shot-hole borer (*Xyleborus fornicatus*).—The investigations on this pest have been continued by the Assistant Entomologist, whose report is given below.

Tea tortrix (*Homona coffearia*) continues to be prevalent in certain districts, and the pest has been reported from a few more estates, which had not been previously recorded as infested.

The " fringed nettle grub " (*Natada nararia*) has again been prevalent in some districts. This pest is also known to breed freely on dadap (*Erythrina* sp.), and can exist on a number of garden trees and shrubs. During the outbreaks of Natada, other species of nettle grubs, such as *Thosea cervina*, *Parasa lepida*, and *Spatulicraspeda castaneiceps*, were also found to occur in small numbers.

Among other leaf-eating caterpillar pests may be mentioned the red slug (*Heterusia cingala*), the lobster caterpillar (*Stauropus alternus*), the small faggot-worm (*Chalia doubledayi*), and the leaf-roller (*Gracilaria theivora*). Specimens of the large caterpillar of the atlas moth (*Attacus atlas*) were also received from tea.

The red borer (*Zeuzera coffeæ*) has been reported or observed on several estates. An outbreak of the hepialid (*Phassus purpurascens*), occurred in a patch of tea which had been rested for the past four years. The caterpillars not only tunnel in the centre of the branches, but eat away the portions of the bark under a covering of frass bound together with a silken webbing. The infested branch may be sometimes completely girdled. There have been no previous records of this borer in tea so far as is known.

The tea leaf-miner (*Oscinis theæ*) is usually to be found in small numbers on most tea estates, but more extensive outbreaks have been reported from a few estates during the year.

The tea termite (*Calotermes militaris*) has been reported from several estates, and continues to be a serious pest. Other species of termites have been observed on tea bushes. These cover portions of the bushes with a film of earth and eat away the dead and diseased bark and wood underneath.

Extensive outbreaks of the scale insects known as " brown bug " (*Saissetia hemispherica*) and " green bug " (*Coccus viridis*) have occurred on some up-country estates.

Tea mites have been prevalent on many estates during the year, the three commonest species being the red spider (*Tetranychus bioculatus*), the yellow mite (*Tarsonymus translucens*), and the purple mite (*Phytoptus carinatus*).

An article on scale insects and mites on tea was published in the " Tropical Agriculturist " for June, 1921.

The following insects have also been reported or observed to be injuring tea during the year :—*Orgyia postica*, the caterpillars of which attacked tea after starting on dadap ; *Chionaspis theæ* ; *Ceylonia theacola*, the tea aphis ; *Astycus immunis*, the adults of which nibbled the leaves of tea as well as dadap. The Passalid beetle (*Chilomazus comptoni*) was found in basket plants in a tea nursery, and another Passalid (*Tiberius* sp.) was noticed near roots of tea bushes. These are probably scavengers in both cases.

Rubber.

Specimens of a large stem and root-boring grub have been received from a few estates during the year. These were apparently the grubs of the Cerambycid (*Batocera rubus*).

Cacao.

The bark-eating borer (*Arbela quadrinotata*) has been prevalent on some estates. An outbreak of the lac insect (*Tachardia albizziæ*) was reported from one estate. This scale is usually controlled by the caterpillars of small moths (*Eublemma* spp.), which feed on the scales inside their resinous covering. The Tortricid (*Adoxophyes privatana*) is occasionally to be found binding together the young leaves and feeding within the " nest " so formed. The adults and nymphs of the spotted locust (*Aularches miliaris*) have been prevalent on the cacao plots at the Experiment Station, Peradeniya, for most of the year. Large numbers of egg masses were dug up and destroyed in November and December. The snail (*Achatina fulica*) continues to be prevalent on estates in the Hantane and Dumbara districts, where it injures young cacao plants. The pest is gradually spreading to new districts.

Coconuts.

The three most important pests are the coconut caterpillar (*Nephantis serinopa*), the rhinoceros or black beetle (*Oryctes rhinoceros*), and the red weevil (*Rhynchophorus ferrugineus*).

Outbreaks of Nephantis have occurred during the year in the Eastern, Southern, and North-Western Provinces, those in the Eastern Province being the most extensive. This caterpillar has been a serious pest in the Eastern Province for many years, and this year the local Plant Pest Board urged that it should be declared a pest under the Ordinance. The Entomologist investigated the outbreaks in the more heavily infested areas, and Nephantis was subsequently declared a pest. A careful survey of the southern part of the Province was made by one of the Plant Pest Inspectors, some 500 coconut estates and gardens being visited. During a serious outbreak of this caterpillar not only is almost every leaf on palms over a large area badly attacked, but the green outer skin of nuts of all sizes may be partially eaten away. Young nuts sometimes fall prematurely as the results of such attacks. The caterpillars were also found feeding on other palms, including palmyra (*Borassus flabellifer*), cabbage palm (*Oreodoxa oleracea*), and the doum palm (*Hyphæne thebaica*). Nephantis is parasitized by at least three different parasites in the Eastern Province, in the caterpillar stage by a small Tachinid fly and by a Braconid wasp, and in the cocoon stage by a Chalcid wasp. These parasites were found to be fairly well distributed throughout the caterpillar infested areas, but their beneficial effect in controlling the pest is somewhat lessened by the presence of hyperparasites, which feed on the parasites, especially the Tachinids. The control measures which have been scheduled in the Ordinance include the use of light traps to attract the moths.

The black beetle and the red weevil both continue to be prevalent in most coconut areas. The black beetle has a wide range of breeding places, among which may be mentioned the following :— Almost any uncovered heap or pit containing decaying vegetable matter, including cattle manure, rice straw, rotting coconut husks and other coconut refuse, and decaying cacao pods ; decaying fallen logs of various palms ; any old standing palms which have lost their crown ; old stumps of coconut (*Cocos nucifera*), palmyra (*Borassus flabellifer*), kitul (*Caryota urens*), and areca (*Areca catechu*) ; and old stumps of jungle trees, especially those in or near coconut clearings. The control of the black beetle by clearing up its breeding places will materially lessen the injury done by the adult beetle to the crowns of palms, and indirectly reduce the number of injured palms likely to be attacked by the red weevil.

Rice.

The investigations on the paddy fly (*Leptocorisa acuta*) have been continued by Mr. G. D. Austin during the greater part of the year. It was found that this bug can exist on several different kinds of wild grasses, such as are usually to be found growing near paddy fields. Experiments made with the use of hand nets and with paddy winnows smeared with sticky material gave good results. Decaying meat failed to attract the bugs, and light traps were not a success. Further experiments are being made along these lines. Natural enemies of *Leptocorisa* include three kinds of predaceous bugs and a hymenopterous egg-parasite. The predaceous bugs are a Pentatomid (*Asopus malaabaricus*) and two Reduviids, (*Harpactor fuscipes* and, probably, *Irantha* sp). These bugs were found feeding on the adult and young stages of the paddy fly, but none of them is of much avail in controlling the pest.

A small outbreak of *Spodoptera mauritia* occurred on the experimental plots of the Economic Botanist at Anuradhapura.

The other insects reported or observed to be injuring paddy include the stem borer (*Schœnobius incertellus*) ; the leaf-eating caterpillars, *Melanitis ismene*, *Dasychira securis*, *Leucania venalba*, and *Lenodora vittata ;* and a small Pentatomid (*Menida histrio*).

Coffee.

The only insects reported or observed on coffee during the year were the " red borer " (*Zeuzera coffeæ*), and the scale insects (*Coccus viridis* and *Saissetia hemispherica*).

Cotton.

Now that the growing of cotton is being started on a larger scale, it is expected that the usual insect pests of this crop will be in evidence. So far only specimens of the leaf-folder (*Sylepta derogata*) and a weevil (*Atactogaster* sp.) eating the cotyledons have been received.

Leguminous Plants.

Erythrina spp. (Dadap).—The shoot and stem borer (*Terastia meticulosalis*) has been reported from several estates during the year. The fringed nettle grub (*Natada nararia*) usually attacks dadap where this green manure plant is growing among tea infested with these caterpillars. The caterpillars of the Lasiocampid, *Eupterote geminata*, have been prevalent towards the end of the year on several estates. Outbreaks of the Lasiocampid (*Taragama dorsalis*) have been reported from a few estates. The weevil (*Astycus immunis*) was observed notching the leaves of dadap on one up-country estate, and specimens were received from another estate with the report of similar injury. The spotted locust (*Aularches miliaris*) was prevalent at the Experiment Station, and was observed on one estate eating dadap, but apparently not attacking tea. The snail (*Achatina fulica*) continues to be a pest of dadap.

Acacia spp.—The fluted scale (*Icerya purchasi*) has not been reported as a pest during the year. The presence of this scale has been reported from the Ratnapura District.

Tephrosia candida (" Boga medaloa ").—Outbreaks of the scale insect (*Ceroplastodes cajani*) have been reported from a few estates during the year, and in one instance the plants were very heavily infested, and died back over an area of several acres. The scales were found to be attacked by at least three different species of small caterpillars. The small beetle (*Araecerus fasciculatus*) is usually to be found attacking the seeds of " Boga."

Plantain (*Musa* spp.).

The weevils (*Odoiporus longicollis* and *Cosmopolites sordidus*) were found to be prevalent in some of the plantain areas near Rambukkana and Alawwa visited by the Entomologist and Assistant Botanist and Mycologist. Odoiporus usually attacks the stem, while Cosmopolites confines its boring mainly to the bulb, although occasionally each invades the territory of the other. These pests are usually worst in neglected plantations and those which have been allowed to run on for several years without replanting

Citrus spp.

Specimens of caterpillars were received towards the end of the year as eating the leaves of orange, lime, and pomelo trees. These larvæ in every case proved to be *Papilio demoleus*. The spiny black fly (*Aleurocanthus woglumi*) has been fairly prevalent during the year on various species of citrus in the Botanic Gardens. A large Lasiocampid caterpillar found eating citrus leaves was bred out to *Suana concolor*.

Tobacco.

An attack of aphids occurred in the Trincomalee District. The aphids were being eaten by the Coccinellids (*Chilomenes sexmaculata* and *Coccinella transversalis*) and by Syrphid larvæ. A small capsid bug (*Gallobelicus crassicornis*) was also present in large numbers on the same area as that attacked by the aphids. The stem borer (*Gnorimoschema heliopa*) and the caterpillars of *Prodenia litura* were sent in from the experimental plots at Peldeniya.

Miscellaneous Pests.

A number of specimens have been received or collected during the year from plants of economic importance, and the following are the more important of these :—The caterpillars of *Prodenia litura* and *Syntomoides imaon* eating the leaves of castor; *Dichocrocis punctiferalis* boring in cardamoms and turmeric ; *Achæa janata* eating the leaves of pomegranate ; the Geometrid (*Fascellina chromataria*) on camphor leaves ; the Cerambycid (*Sthenias grisator*) girdling the stems of manioc ; *Hypsipyla robusta*, the toona borer, and the lac insect (*Tachardia albizziæ*) on *Nephelium litchi*.

Parasites.

A large number of hymenopterous and dipterous parasites have been bred out during the past few years, and some of these have been sent away for identification. The following identifications of Tachinidæ have been received from Mr. J. D. Tothill of the Canadian Department of Agriculture :— *Exorista gnava* Meig. from pupæ of *Caprinia conchylalis* and larvæ of *Stauropus alternus ; Exorista* sp. from cocoons of *Heterusia cingala ; Tricholyga sorbillans* W. from larvæ of *Orgyia postica ;* probably *Cuphocera pyrogaster* Rond. from larvæ of *Spodoptera mauritia ; Frontina* sp. n., from larvæ of *Nacoleia annubilata ; Masicera* sp. from *Icerya ægyptiaca.*

J. C. HUTSON,
Entomologist.

January 30, 1922.

REPORT OF THE ASSISTANT ENTOMOLOGIST, 1921.

The Assistant Entomologist was obliged to leave Sarnia estate early in April, owing to the arrival in the Island of Colonel W. G. B. Dickson, and to return to Headquarters at Peradeniya. The experiments in progress on this estate have, however, been continued, and periodical visits have been made to examine the plots under experiment.

Since the departure on leave on July 20 of Mr. Jardine, the Assistant Entomolgist has acted as Plant Pest Inspector, Central, in addition to his own duties.

Manurial Experiments.—During the year attention in regard to shot-hole borer of tea (*Xyleborus fornicatus*) has been concentrated principally upon attempts to limit the incidence of borer by cultural methods. There is a growing tendency on the part of planters to attribute a reduction in borer attack to improved cultivation, and while statements to this effect are constantly made, it is an extremely difficult matter to confirm or refute these observations by experiment.

Several experiments have been commenced at Sarnia estate with the object of ascertaining—

(1) Whether any particular element, *e.g.*, nitrogen, potash, or phosphoric acid, assists the bushes to withstand attack.
(2) Whether borer attack is curtailed by manuring generally.
(3) What part liberal manuring plays in promoting the process of gallery-entrance healing.

None of the experiments have reached a stage at which any definite conclusions may be drawn, but from observations made up to the time of writing it appears that no individual manure assists the bushes to withstand attack.

It will not be possible until February, 1922, to make observations regarding the effect of manuring generally upon borer, as the attack in the field in which these experiments are in progress is so slight at present that an examination will serve no useful purpose. These experiments are intended to demonstrate whether plots liberally manured are less heavily attacked by borer than plots receiving no manure at a period between prunings, when the heaviest infestation is expected to occur.

Castor Plant Trap-Tree Experiments.—Owing to the failure of a large experiment with castor plant as a trap-tree for shot-hole borer, which was commenced near Kandy in December, 1919, four new experiments have been commenced in the Badulla, Balangoda, Hewaheta Lower, and Wattegama districts. In the original experiment the plants were destroyed by a "rust" (*Melampsorella ricini*).

The best-grown plants in the Badulla experiment, which are now nearly a year old, have already commenced to attract borer in large numbers. Castor plants at an elevation of over 4,000 feet have been found heavily infested by (*X. fornicatus*) during the year.

Burial of Pruning Experiments.—In the early part of the year an experiment on a large scale was conducted to ascertain the effect of certain manures and insecticides upon the inmates of galleries when buried with prunings. Over 10,500 galleries were examined in the course of this experiment, which was continued for a period of sixty-four days. The substances experimented with were—

Manures : Nitrate of potash, muriate of potash, Sulphate of ammonia, nitrate of soda, basic slag, nitrolim, and ephos phosphate; *chemical salts :* iron sulphate and copper sulphate; *simple insecticides :* tar water, phenol, flowers of sulphur, and chloride of lime; and *proprietary insecticides :* "katakilla," agrisol, kerisol, "soil insecticide," and apterite.

Only four substances showed any benefit, viz., kerisol, agrisol, apterite, and phenol. Further experiments are contemplated to test these four substances on a larger scale and at reduced rates in order to ascertain whether the cost of treatment can be reduced without sacrificing the efficiency of these materials.

Observations regarding the behaviour and habits of *X. fornicatus* in buried prunings have also been made. Development is able to proceed beneath the soil for a considerable period, all stages of the borer having been found in daily examinations of the prunings up to nine weeks after burying. The

percentage of galleries occupied by all stages of the borer beneath the soil falls from 91·7 per cent. to 18·5 per cent. in a period of sixty-four days, and in the same period the total inmates per 100 galleries from 488 to 103·5. It has already been demonstrated that borers can make their way to the surface when buried, so that burying alone is no safeguard against the later emergence of beetles from the buried prunings, a process which is able to proceed for a considerable period after burial.

Prevalence of Shot-hole Borer.—At the request of the Estate Products Committee of the Board of Agriculture a circular was sent to all estates infested by shot-hole borer, with the object of ascertaining the prevailing opinion regarding the present status of the pest. Replies were received from 73·5 per cent. of those addressed. Of the total opinions received for all districts, a majority of 31·8 per cent. decide against borer being more prevalent, 33·6 per cent. against borer spreading on estates, and 15 per cent. against borer spreading in districts. General opinion favours borer being more prevalent on estates in Knuckles, Kotmale, and Medamahanuwara; to be extending its area of attack on estates in Haputale, Knuckles, Madulsima, Medamahanuwara, Ratnapura, and Wattegama; and to be spreading in the following districts :—Badulla, Haputale, Knuckles, Kotmale, Medamahanuwara, and Wattegama.

In connection with the remarks made above in reference to manurial experiments, it is interesting to record that seventy-four opinions were volunteered in regard to the connection between improved cultivation and reduced borer attack. Had opinions been invited on this point, it is anticipated that there would have been a very large number of opinions in favour of good cultivation exercising a controlling influence on borer prevalence.

Reports and Addresses.—Reports have been written on several subjects connected with the shot-hole borer investigation, and a general account of the progress of the investigation was given before the Estate Products Committee of the Board of Agriculture in January, and a short account before the same committee of proposed alterations to the shot-hole borer regulations in November.

Itinerary.—Several visits to estates have been made in connection with shot-hole borer, and sixty days were spent in travelling during the year. One visit was made to the Colombo Fumigatorium with the Entomologist.

Inquiries and Correspondence.—The number of inquiries in regard to shot-hole borer during the year have been less than in previous years, and this is considered as an indication that borer is not as troublesome a pest as formerly. The total letters attended to during the year numbered 638, of which 311 were received and 327 despatched.

F. P. JEPSON,
Assistant Entomologist.

January 30, 1922.

III.—DIVISION OF PLANT PESTS AND DISEASES INSPECTION.

CENTRAL.

INSPECTION OF ESTATES AND GARDENS.

THE inspection of tea estates and gardens in the Central Province has been continued during the year. With the exception of 112 estates in Dimbula, the inspection of the tea estates in the Central Province has been completed. The number of estates inspected during the period under review was 262, covering over 80,000 acres, and the number of gardens 824. The large number of tea gardens situated in the Kadugannawa-Gampola-Peradeniya triangle have now been completed, with the exception of those in a few villages.

PLANT PESTS AND DISEASES LEGISLATION.

In accordance with the regulations made under Ordinance No. 5 of 1901, 121 estates and 820 gardens have been scheduled as being infested by shot-hole borer (*Xyleborus fornicatus*), and 14 estates by fluted scale (*Icerya purchasi*).

Under Ordinance No. 6 of 1907 the coconut caterpillar (*Nephantis serinopa*) has been proclaimed as a pest, and measures advised for its treatment.

The Shot-hole Borer Regulations made under Ordinance No. 5 of 1901 have undergone revision during the year, sections 6 and 9 being amended to allow of tea plants being removed on permit from an estate scheduled as infested to another estate in the infested areas, providing they do not in transit enter the areas known to be free from borer. Before the revision of these regulations, plants could not, under any conditions, be removed from an estate scheduled as infested. This amendment of the regulations will probably lead to a greatly increased traffic in nursery stock in the future, especially in view of the fact that the importation of tea seed from India has been prohibited.

PERMITS FOR THE SALE OF TEA PLANTS.

The number of plants sold on permit during the year was 2,562,050. These plants were covered by ninety permits. Eighteen applications for permits for the sale of plants in the infested districts were refused.

Insect Pests recorded.

The following insect pests have been recorded during the year in the course of inspections of estates and gardens :—

Tea.

Shot-hole borer, *Xyleborus fornicatus.*
Tea leaf miner, *Oscinis theæ.*
Tea aphis, *Ceylonia theacola.*
Brown bug, *Saissetia hemispherica.*
White leaf louse, *Chionaspis theæ.*
Termites, chiefly *Calotermes militaris.*
Tea tortrix, *Homona coffearia.*
Tea leaf roller, *Gracilaria theivora.*
Red borer, *Zeuzera coffeæ.*
Fringed nettle grub, *Natada nararia.*
Lobster caterpillar, *Stauropus alternus.*
Small bagworm, *Psyche albipes.*
Red slug, *Heterusia cingala.*
Red spider, *Tetranychus bioculatus.*

Erythrina lithosperma Dadap.
Dadap caterpillar, *Taragama dorsalis.*
Spotted locust, *Aularches miliaris.*
Dadap stem-borer, *Terastia meticulosalis.*

Acacia spp.
Fluted scale, *Icerya purchasi.*

Eucalyptus Robusta Gum.
Tea tortrix, *Homona coffearia.*

Albizzia spp.
Tea tortrix, *Homona coffearia.*

Cedrela toona, Toona.
Toona shoot-borer, *Hypsipyla robusta.*

Miscellaneous.
Cardamoms, *Dichocrocis punctiferalis.*
Common garden plants, Kalutara snail (*Achatina fulica*). This mollusc has now appeared in the Badulla District.

General.

The card index files have been kept up to date and two additional files commenced, one to record all unscheduled pests observed in the course of inspection of estates and gardens, and the other to record all information in connection with applications for the sale of tea plants.

A large poster illustrating the several stages in the life history of shot-hole borer was distributed to all those interested. This was printed in English, Tamil, and Sinhalese, and 1,789 posters in these languages were distributed during the year, and it is believed that they were much appreciated.

F. P. JEPSON,
January 1, 1922. Acting Plant Pest and Disease Inspector (Central).

SOUTHERN.

The Plant Pests and Diseases Inspectorate, Southern, commenced its functions in October with one Inspector and three Sub-Inspectors. Its duties have been—

(*a*) To form an office at Honiton estate, Avissawella.
(*b*) To inspect estates and gardens.
(*c*) While performing these duties to get into touch with the Ratemahatmayas of the districts, the Koralas, and the Arachchies, and to explain to them the objects of the Inspectorate, with a view to the future education of the growers in the pests and diseases affecting rubber and the low-country products generally.
(*d*) To help all growers in the manufacture of rubber of good quality.
(*e*) To help the Department in the gazetting of gardens and estates infested by shot-hole borer (*Xyleborus fornicatus*).

Since October, 1921, ten estates and eighty-one gardens have been inspected. One estate and nine gardens were found to be infested by shot-hole borer (*Xyleborus fornicatus*).

Special attention has been paid to the distribution of plaintain disease (bunchy top) and the chances of finding some immune variety.

Some help has been given, more especially to small holders, in regard to the manufacture of sheet rubber.

A. T. REEVE,
January 27, 1922. Inspector for Plant Pests and Diseases (Southern).

IV.—REPORT OF THE GOVERNMENT CHEMIST FOR 1921.

The laboratory work during the year included analyses of the following materials :—

	Samples.		Samples.
Castor oil and poonacs ..	3	Green manures	1
Rubber	5	Wood ashes	1
Camphor prunings ..	3	Tea ash analysis	6
Cinnamon	2	Lime stones	—
Chenopodium oils	7	Soil survey, forest ..	50
Tree seed oils	5	Soil survey, paddy ..	112
Bees wax	1	Soils for lime cultivation ..	3
Gums	1	Soils, tobacco	4
Grasses for cellulose ..	3	Soils, rubber	6
Bamboos	2	Soils, sugar cane plots ..	2
Pith	1		
Tar	1		245
Limes for citric acid ..	25		
Cane jaggery	1		

CAMPHOR.

The distillation of old camphor shoots from the Government Experiment Station, Peradeniya, gave 0·63 per cent. of camphor crystals on the fresh material. Hakgalla twigs, which had partly dried in transit, gave 2·1 per cent. of camphor, equivalent to 0·84 per cent. on the fresh material.

CHENOPODIUM.

Chenopodium seed was distilled in several lots of 1,000 grammes to determine the effect of time of distillation necessary. The yield of oil varied from 0·35 per cent. to 0·65 per cent., and the average was 0·42 per cent.

The specific gravity of the oil at 29° C. was only 0·913, against the United States requirements of 0·955 at 25° C., and the yield of American Wormseed *Chenopodium ambrosioides* L. var. *Anthelmintium* is said to be 0·6 to 1 per cent. from the seeds. The oil obtained from the Ceylon seed was tested by Dr. Jacocks with fairly satisfactory results.

An inquiry is being made as to the possibility of establishing an oil industry in Ceylon on a small scale to extract oils from rubber, castor, kekuna, ratakekuna, domba, mee, and other local seeds. These could be obtained during different months of the year, and yield valuable medicinal, drying, and non-drying oils. Domba oil is obtained from seeds of *Calophyllum inophyllum*. There are two varieties of kekuna oil: one obtained from *Aleurites triloba* and ratakekuna from *Canarium Zeylanicum*.

Mi oil is obtained from the seed of *Bassia longifolia*, which takes the place of *Bassia latifolia* in India.

Seeds were collected and sent in by the Forest Department, and gave the following results :—

	Domba. Grammes.	*Kekuna.* Grammes.	*Ratakekuna.* Grammes.	*Mi.* Grammes.	*Domba.* Grammes.
1,000 seeds ..	7,480	6,420	5,420	1,200	5,060
Shell	3,820	4,240	5,060	280	2,020
Kernel	3,660	2,180	360	920	3,040
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Containing oil ..	63·0	46·4	61·3	51·4	67·1
Containing nitrogen ..	0·98	3·50	2·46	7·00	0·9
Containing ash ..	1·30	3·34	3·80	1·68	1·32

LIMES.

A large number of limes from different parts of Ceylon collected in periods of dry and wet weather were analyzed, and in most cases the citric acid converted into citrate of lime.

The average Ceylon limes are smaller than the West Indian limes, weighing from 1 to 1·42 oz. per lime, compared with 1·72 to 2 oz. per lime for the West Indian limes. The citric acid content varied from 12 to 14 oz. per gallon, the lower percentage usually occurring after periods of wet weather.

Selected limes from well-grown trees were equal in weight to West Indian limes, but contained 12·5 per cent. of citric acid per gallon.

Samples of the citrate of lime and concentrated juice were shown at the Galle Show, and reports on the investigations have been published.

The seed content average seven seeds per lime. From 830 to 990 limes yield one pound of dried seed containing 6,150 seeds. The germination is good, and 1,000 limes would yield enough seed for 30 to 40 acres at 135 trees per acre.

PAPER MAKING.

The bamboos and grasses in which the cellulose was estimated for paper making purposes included the small bamboo, *Ochlandria stridulata*, Sinhalese "Bata," common in the Ratnapura District. It measures 15 feet to 17 feet in length, and yields 48 per cent. of cellulose on the original plant containing 10·5 per cent. of water.

Large areas of illuk grass covering several square miles occur in the Eastern Province near the Badulla-Batticaloa road. A sample of the grass was treated for cellulose, yielding 45 per cent. easily bleached long-fibred pulp. Paper manufacturers consider that alone it is suitable for high class printing papers, and if mixed with 20 per cent. of rags would produce excellent writing paper.

A large area of grass (*Anthistiria symboria*) suitable for paper making also occurs near Balangoda, analysis showed a cellulose content of 43·5 per cent. calculated on the air-dried grass with 9 per cent. moisture.

GREEN MANURES.

Gliricidia maculata is now being tried as a green manure for tea. Analyses of the lopped branches and leaves of the trees grown in the Experiment Station tea plots gave 2·45 per cent. of nitrogen on the sun-dried material, compared with 2·65 per cent. in dadaps and 2·40 per cent. in *Acacia decurrens*. The ash amounted to 8·6 per cent., and is rich in lime, magnesia, and potash, but the phosphoric acid is low. Further analyses are being made of dadap and Gliricidia loppings planted and lopped about the same time.

TEA LEAVES FROM MANURED PLOTS.

Leaf from plots manured with nitrogen and phosphoric acid, nitrogen, and potash; nitrogen, potash, and phosphoric acid; potash and phosphoric acid; and nitrogen only have been analyzed.

There was no marked variation in composition, except in the leaf from plots 148A and 148B manured respectively with potash and phosphoric acid, and the same ingredients with nitrogen.

	No Nitrogen. Per Cent.	Complete Manure. Per Cent.
Nitrogen	3·25	3·91
Tannin	17·37	21·29
Total extract	36·80	38·80
Ash	5·42	5·78
Containing lime	13·60	15·60
Containing potash	42·40	42·02
Containing phosphoric acid	16·64	15·36

The nitrogen, total extract, tannin, and ash are all increased by the manure with nitrogen, and the lime in the ash is also rather higher, while the phosphoric acid and potash are slightly lower. Comparing the nitrogen only plots, there is a variation in the total solids of 1·6 per cent., but plot 146B, with the lower total solids, has 2·43 per cent. more tannin.

The omission of potash from these plots has lowered the potash content of the ash by an average of 2·4 per cent. compared with plots 146 and 147A, and the omission of phosphoric acid by 0·77 per cent. of that constituent.

Considering the variability of the bushes from which the samples of leaf were taken, the analyses indicate a fairly uniform composition in the Manipuri indigenous plots.

Forest Soils.

The analyses of forest soils from different parts of Ceylon to determine the limiting factors of growth is being continued, also the paddy soil survey of Ceylon and other tropical countries, on which a separate report will be issued.

M. KELWAY BAMBER,
Government Agricultural Chemist.

March 15, 1922.

V.—REPORT OF THE DIVISION OF ECONOMIC BOTANY FOR 1921.

Introductory.

The attention of the Division continues to be confined to the selection of paddy varieties for improvement in yield.

The period covered by this report includes the maha season, 1920–21; the yala season, 1921; and the commencement of the maha season, 1921–22.

Policy.

The policy of straight selection for yield alone, as devised by the former Economic Botanist, has been rigidly adhered to for material ranging from three to seven months in age. Selection is carried out on a pure line basis at the two Government Experiment Stations at Anuradhapura in the dry zone and Peradeniya in the hill country. These extracted lines are tried out for fixity of type, and are then grown on in plots of standard size for comparative test. The final stage consists in transferring the successful ones to larger areas for seed multiplication and ultimate distribution to approved cultivators. It is thus hoped to introduce the improved strains to the goiya for general use.

There are not sufficient soil and climatic differences in Ceylon to warrant the many types of paddy now grown, and if a smaller number of improved types could be relied on, the yield per acre for the Island would automatically be raised.

No attempt has been made to classify the types botanically. The varieties have been selected for trial on a popularity basis, provided that they would grow successfully at the two stations available.

Work of Year.—Maha Season, 1920–21.

Selection work was confined to two main groups—the ma-wi and samba paddies.

(*A*) *Ma-wi Selections.*

(*a*) *Anuradhapura Experiment Station.*—421 pure lines were transplanted by the former Economic Botanist in November, 1920. Harvesting began in March, 1921, under the supervision of the Assistant to the Economic Botanist. Some promising yields were given, and 45 pure lines have been selected for comparative trial in standard plots at this station in maha, 1921–22. Material from this harvest is also to be used at Peradeniya as being more successful than the crop grown on that station. 26 lines have been laid down there. The yields of the selected lines vary between 73 and 170 bushels per acre (calculated).

(*b*) *Peradeniya Experiment Station.*—179 lines of similar varietal extraction were put in during October, 1920. The yields were poor, the nature of the fields being largely responsible. No selection work was possible.

(*B*) *Samba Selections.*

(*a*) *Anuradhapura Experiment Station.*—155 pure lines were transplanted in November, 1920, of which 7 have been carried on at this station in comparative test plots and 6 at Peradeniya during this maha (1921–22). Further selection was limited by lack of space. The yields varied from 66 to 101 bushels per acre (calculated).

(*b*) *Peradeniya Experiment Station.*—44 lines of similar varietal extraction were transplanted in October, 1920. Progress was poor, and selection was abandoned owing to the superior nature of the Anuradhapura samples.

Yala Season, 1921.

Acting on the suggestions of the former Economic Botanist, the Assistant to the Economic Botanist, under the general supervision of the Director of Agriculture, sowed down the following selections of shortage paddies :—

	Dry Zone Experimental Station.	Experimental Station, Peradeniya.
Bala-wi group	32	18
Danahala group	55	20
Illankalayan group	11	7
Murunkan group	77	48
Heenati	217	142

Certain other lines selected by the former Economist Botanist were laid down at the Anuradhapura Experiment Station, viz. :—

19 lines of Suwandael	11 lines of Madoluwa
15 lines of Suduhatiel	1 line of Kalupanniti

and 8 further lines were sown on larger areas for comparative trial and seed multiplication. At the Peradeniya Experiment Station 3 extra lines were included for comparative trial in a similar manner.

(*a*) *Anuradhapura Experiment Station.*—The first duty of the present Economic Botanist on arrival in the Colony was the transplanting of these paddies during May, 1921. The seedlings were transplanted at 9-inch intervals in plots of 9 feet broad, the length varying with the number of seedlings available. The season proved very bad, and much damage was occasioned by pests and rain. Temporary selections have been made with a view to repeating some of these lines for comparative trial next yala season. Yields of the lines chosen vary between 53 and 132 bushels per acre (calculated). Some 33 bushels were raised for distribution.

(*b*) *Peradeniya Experiment Station.*—A similar plan was adopted, but the results were disappointing, and it will be necessary to repeat the experiments to see how far bad soil conditions were responsible. There is a pernicious deposit of iron, which has caused several lines to be complete failures, not a single plant surviving. A fresh set of fields has been cultivated for the maha season.

MAHA SEASON, 1921–22.

Material was selected entirely from the harvest at the Anuradhapura Experiment Station on the previous maha, *i.e.*, from the ma-wi and samba groups.

(*a*) *Anuradhapura Experiment Station.*—An important innovation is the provision of a series of fields of standard size. These have been accurately surveyed, and blocks of palu wood are sunk at the corners of each field. The area of a field is slightly more than ⅛ acre.

Fifty-two lines are laid down in plots of 4 feet 6 inches by 40 feet 6 inches, each being repeated eight times for comparative trial. Planting is at 6 inches intervals. Progress at present is good. A field of Tillanayakam has been put down for selection work and comparative purposes. An experiment to observe the results of early and late transplanting is in progress.

(*b*) *Peradeniya Experiment Station.*—A new area is being tried. The fields are too new for comparative trials, but 26 lines of ma-wi and 6 lines of samba are being repeated three times in plots of 4 feet 6 inches by 40 feet 6 inches to be compared with local Hatiel growing alongside, in order to isolate types which promise an improved yield in this locality. This station is rain fed, and a serious shortage of water has been felt.

GENERAL.

During the year the following other matters have received attention :—

(1) A collection of eight salt and flood resisting varieties was despatched to the Divisional Superintendent of Agriculture, Deccan Canals, Kopergaon, India, for experiment. Some seed was kept back for experiment here.

(2) A collection of the five earliest paddies of Ceylon was sent to the Deputy Director of Agriculture, Northern Circle, Jubbulpore, for experiment.

(3) A successful appeal to cultivators to co-operate in trying out certain lines in other areas has been made. Seed has already been forwarded to three cultivators.

(4) Communication has been established with the Official Seed Testing Station, Cambridge, England, with a view to standardizing methods of seed testing.

(5) Samples of twenty pure lines were despatched to British Guiana for experiment.

(6) A classification of types of cacao pods on the breeding plot at the Peradeniya Experiment Station has been investigated by the Assistant to the Economic Botanist. This will appear in Bulletin form in due course.

R. O. ILIFFE,
Economic Botanist.

Peradeniya, January 7, 1922.

VI.—REPORT OF THE CENTRAL EXPERIMENT STATION, PERADENIYA, FOR 1921.

THE year was an abnormally dry one. 67·91 inches of rain fell, against an average of 89·23. Planting operations were seriously interfered with. Weeding was facilitated.

TEA.

The manurial experiments were continued. Large prunings were burnt in order to destroy as many shot-hole borer beetles as possible, the leaves and small twigs were forked in with basic slag and sulphate of potash.

All the old tea was heavily pruned in October and November. Plots 163 and 164 of young tea planted in November, 1915, was brought into bearing in June. The hillside tea clearing of 8 acres was topped, and will be taken into bearing early in 1922. This clearing was supplied in June, July, and August. 11,000 stumps were put in, but the weather was most unfavourable. 28,546 lb. of green leaf were harvested and sold to New Peradeniya estate. The price paid has risen from 2½ cents to 8 cents per lb. of green leaf during the year.

All jungle stumps were eradicated and removed or destroyed.

CACAO.

The spring crop was practically a failure, but the autumn crop was exceptionally heavy. Diseased pods were picked monthly.

A general round of plant sanitation was carried out. Several tons of large dadap logs were removed by elephant. Dead stumps were eradicated and removed or burnt, bark canker was treated, and loranthus removed. The manurial experiments were continued.

A moderate pruning and partial lopping of shade was given in January and February. Prices realized for best cacao remained in the neighbourhood of Rs. 40 to Rs. 41 per cwt.

Rubber.

A new experiment was started on April 1 in 2 acres of 9-year old rubber grown from seed of No. 2 tree, Henaratgoda. The yield of dry rubber from each tree is being separately recorded, with the object of ascertaining the proportion of high-yielding and poor-yielding trees. The following experiments have been continued :—

(1) Two- and three-day tapping trials.
(2) Two series of manurial experiments.

Vacancies in the " New Avenue " and " Bandaratenne " rubber were supplied three times.

In the New Avenue rubber a variety of selected green manures were planted to replace the scattered old dadap, and Gliricidia trees removed early in the year.

In the hillside and hilltop rubber terracing was repaired. The girths of the trees have been measured to compare the growth in the three different methods of planting found.

Four and a half acres of young rubber were interplanted with coffee.

Coconuts.

Seed nuts of nineteen different varieties have been sent by Gate Mudaliyar A. E. Rajapakse, and planted in nursery beds for eventual transplanting to the fodder grass plots.

Seventy-six plants of dwarf coconuts received in 1920 from the Federated Malay States were planted out on the river bank.

The Bandaratenne coconut plot has been drained on a new plan to facilitate inter-cultivation. The cultivation of this plot has been maintained. The crop was satisfactory, 47,937 nuts were harvested. Prices have remained poor.

Coffee.

Eighty-five orders for seed and eighteen orders for plants of the Robusta type of coffees were supplied. The interest taken in these coffees has certainly not decreased, though some estates are now supplying seed, and this has resulted in a decrease in demand from the Experiment Station.

Some trouble has been experienced from die back caused by *Colletrotrichum coffeanum*, and experimental spraying against this disease has been undertaken. Shade trees were periodically lopped. Seed of seven varieties of coffee were received from Belgian Congo, of these, *Coffea arnoldiana*, *Coffea aruwimiensis*, and *Coffea klainii* are new varieties to the Experiment Station.

A small experiment was started in December to compare the results from—

(1) Cattle manure and forking.
(2) Heavy mulching, but no cultivation.
(3) Plain forking.

Paddy.

The following varieties were grown in the new paddy area completed in 1920 in the maha season, 1920–21 :—Village Hatiel, Muttusamba, Dr. Lock's Hatiel, Indrasail, Gizasamba, Jeerasamba, Macan Pina.

During the remainder of the year the majority of the paddy land was placed at the disposal of the Economic Botanist, and no other work of importance undertaken. An extreme shortage of water seriously handicapped operations in the new paddy area.

Tubers.

A large number of varieties of sweet potatoes, maniocs, and dioscorea yams were transferred from the Royal Botanic Gardens and the Stock Gardens to the Experiment Station early in the year. The work of obtaining a succession of reliable yields from all these varieties will probably take two years.

Cereals.

Several varieties of millets were received from Washington and Egypt, and grown in show plots. Their growth was good, but they invariably became diseased, and do not appear well suited to this district.

Four varieties of maize were received from the Bureau of Plant Industry, Washington, United States of America ; of these, Brazos white corn, Singleton, strawberry, and United States selection 119 corn gave good results, while North-Western Dent corn proved a failure. A sample of Buck wheat seed was received from South Africa, and gave fairly successful results.

Fodder Grasses.

The following plots of fodder grasses were added during the year :—

Paspalum virgatum	½ acre
Paspalum dilatatum	½ acre
Rhodes grass (*Chloris gayana*)	1 acre

The Natal grass and Bermuda grass plots promised no utility, and have been abolished. Planting material of Sudan grass and Kikuya grass was received from Australia ; these grasses are being multiplied for future tests.

Fibres.

Plots of Bowstring hemp (*Sanseviera zeylanica*) and New Zealand flax (*Phormium tenax*) have been established. The old plots of Sisal hemp, Mauritius hemp, and China grass (*Boehmeria nivea*) have been uprooted, as plots have been established in the new economic collection.

Legumes.

A number of varieties of cow peas have been received from Fiji and from America. These have mostly grown well, but are very liable to attack by Kalutara snails in the early stages. This proved a difficulty in testing them on a field scale.

ECONOMIC COLLECTION.

Out of the eighty-three plots laid out for permanent economic products, twenty-seven have been planted up during the year, and seedlings or seeds have been obtained for a number of further plots.

A further area of approximately 10 acres has been prepared for planting up with annual economic products. For this purpose it has been necessary to pick up and cover in an old metalled road and cut a new road.

GENERAL.

A large amount of labour was spent on the completion of the cutting of the new road round the economic plots. All roads round the office, bungalows, and show plots were re-gravelled.

The health of the labour force has been satisfactory. The supply of labour has been adequate for the funds available.

T. H. HOLLAND,
Manager, Experiment Station, Peradeniya.

January 12, 1922.

REPORTS OF DIVISIONAL AGRICULTURAL OFFICERS AND AGRICULTURAL INSTRUCTORS ATTACHED TO HEAD OFFICE.

CENTRAL DIVISION.

ON the average eleven days per month were spent by the Divisional Agricultural Officer on circuit.

In January all Agricultural Instructors were transferred from the Ceylon Agricultural Society to the Department, and steps were taken to divide the Division into ranges and for an Agricultural Instructor to be allotted to each range, as follows :—

Kandy District ..	.. 3 ..	Katugatota, Teldeniya, Gampola
Matale District ..	.. 3 ..	South, East, North.
Nuwara Eliya District ..	.. 3 ..	Walapane, Uda Hewaheta, Kotmale.
Kegalla District ..	.. 2 ..	Kegalla, Ruwanwella.

In Kegalla District each Agricultural Instructor has had the assistance of two vernacular Agricultural Instructors. This system, which works moderately well, is not found in any other range.

An Inspector of School Gardens was appointed in January. This officer for the first nine months was responsible for school garden work in Uva Province in addition to his work in the division.

An Inspector of Co-operative Societies—a long-felt want—was appointed in December, and on December 8 the Divisional Agricultural Officer became an Assistant Registrar.

AGRICULTURAL EXPERIMENTS AND DEMONSTRATIONS.

Tobacco varietal tests have been continued on a fresh trial ground of 3 acres with six varieties of cigar types (American). In the aggregate a crop of 967 lb. of tobacco was produced. Reports on the 1919 and 1920 crop tobaccos have been obtained from England and from India ; and it would appear that there is no market for such tobacco in England.

The manufacture of cigars has been undertaken. 8,000 cigars have so far been prepared from our 1919 and 1920 crop tobacco, and these will be placed on the local market.

Experiments in the transport of fresh milk from up-country to Colombo were undertaken during the months of June to October, with the co-operation of the Government Analyst. The experiments showed that sterilized milk could be transported on ice by rail by night or by day to Colombo with satisfactory results, provided such milk was promptly retailed.

Cotton trial plots have been started at the beginning of the north-east rains. Twenty-seven plots were sown with Cambodia cotton in the Matale North, Dumbara, and Walapane ranges.

A site for a District Experiment Station for Matale has been selected at Nalanda, consisting of a block of 34 acres of jungle land adjoining the North road bridge crossing the Nalanda-oya. Most of the land is irrigable, and in addition to other advantages, it is situated in an important tobacco-growing and a potential cotton-growing centre. A survey of the land has been undertaken.

FOOD PRODUCTS.

The Mediwake chena rotation experiments, which have been conducted with some degree of success by the teacher, Mediwaka school, have entered upon a second year of activity. The teacher shows commendable keenness in his work, and given favourable seasons, interesting results should be forthcoming with the close of the third year.

Paddy-manuring experimental areas, each 2 to 4 acres in extent, have been taken in hand in important paddy-growing centres. Series of trials in the application of green manures, with or without the addition of phosphates. were started in the maha season in eight centres—two in Kandy District. three in Matale District, and three in Kegalla District. These areas will, at any rate, serve to stimulate interest in the subject of manuring for paddy.

More than sixty paddy manuring and transplanting demonstration plots have been established by Agricultural Instructors, notably in the Katugastota, Matale North, Kegalla, and Ruwanwella ranges.

Paddy field ploughing demonstrations with the Sinhalese improved " Goiya " Meston ploughs given in the Kegalla District by the Kegalla Agricultural Instructor have aroused a considerable amount of interest, and resulted in a few purchases. Cultivators generally agreed as to the value of the work which can be done by the ploughs, but considered that the draught was too heavy for their buffaloes and that the price was beyond their means.

Agricultural Shows and Competitions.

The Annual Agri-Horticultural Show was held in Nuwara Eliya on April 28 and 29, and a District Agri-Horticultural Show at Matale on July 18 and 19.

At the Matale Show a Departmental Section, educational and not competitive, organized by the Division, was a novel feature, and aroused considerable interest.

Competitions have been organized as follows :—Paddy field competitions for the maha season in the three divisions of Matale District, in Uda Hewaheta and Walapane divisions of Nuwara Eliya District, and in the four divisions of Kegalla District. Paddy manuring and transplanting competitions in the four divisions of Kegalla District. Vegetable garden competitions in Harispattu, Pata Hewaheta, and Pata Dumbara of Kandy District ; in the three divisions of Matale District ; and the four divisions of Kegalla District ; and gala cattle manure competitions for the three divisions of Nuwara Eliya District.

Cultivators are taking keen interest in these competitions. Agricultural Instructors in co-operation with Chief Headmen are assisting in the arrangements and the judging.

In conjunction with the Nuwara Eliya Show, a school gardens competition was arranged.

As far as the Central Division is concerned, field competitions as a means of stimulating the village cultivator's interest in the possibilities of agricultural improvements are preferable to Shows.

Agricultural Education.

School of Tropical Agriculture.

In January there were two English and no vernacular classes.

One full English course was completed in March (seventeen men), and a new class admitted in May. In May two vernacular classes of twelve men each were also formed—one for headmen terminating in December and one for teachers terminating in March, 1922. All courses of the school now commence in May.

For the session beginning May, 1921, all English classes were accommodated in the new school buildings.

After October all activities of the school were located at Irene estate. Headmen and teachers continued to occupy rented houses outside, in Getambe and Peradeniya Junction respectively.

During the year the buildings completed were :—Extensions to hostel, school buildings, two small bungalows for staff, field store, milk room, and rubber room. The school office, which had been located in the Entomologist's block, Head Office, was moved in April to the Divisional Agricultural Officer, Central Division's Office (S.B.G.'s block), near class rooms, and in September to the new school building.

The staff consisted of the Registrar and Messrs. J. C. Drieberg (for estate work and estate routine), C. Canagaretnam (English work and Tamil headmen). Mr. C. Wickramaratne came on duty in May. In October Mr. G. V. Wickremesekera was attached to the school, thus relieving Mr. Canagaretnam for the Tamil work. The Registrar was away on military duty, July 16–31.

The Manager, Experiment Station, Peradeniya ; the Curator, Royal Botanic Gardens, Peradeniya ; and Muhandiram N. Wickramaratna again assisted during the year in planting, horticulture, and co-operation.

On September 8 Mr. D. Clement de Silva, Accountant of New Peradeniya estate, died. He had been lecturer in Estate Accounts to the school since its inception, and by his death the school suffered a great loss.

Inspections by the Director and the Divisional Agricultural Officer, Central, were regularly made, and weekly and monthly conferences of staff were held.

At the end of December the post of Registrar was abolished. Mr. C. Canagaretnam was at the same time transferred to the field branch of the service and posted at Anuradhapura.

1919–21 English Course.

Seventeen students admitted in May, 1919, completed the full English course in March, 1921, on the results of which the following awards were made :—

"The Rajapakse Gold Medal" for the best all-round student — D. R. M. Rajapakse.

Prizes.

For Agriculture :—

First	..	"The Dias Bandaranayake Prize"	.. D. R. M. Rajapakse
Second	..	"The De Soysa Prize"	.. V. C. A. de Mel

For Agricultural Botany :—

First	..	"The Bibile Prize" ..	.. R. S. D. Jansz
Second	..	"The Pandittasekera Prize"	.. T. J. Jayarettnam

For Agricultural Zoology :—

First	..	"The Salgado Prize" ..	.. D. R. M. Rajapakse
Second	..	"The Ratwatte Prize"	.. M. L. Mohamed Ali

For Agricultural Chemistry :—

First	..	"The Fernando Prize"	.. M. L. Mohamed Ali
Second	..	"The De Silva Prize"	.. A. S. Dharmaratnam

For Agricultural Economics :—

First	..	"The De Mel Prize"	.. T. V. Thamotheram
Second	..	"The Wickremaratne Prize"	.. T. J. Jayarettnam.

Certificates.

Class 1.—A. S. Dharmaratnam and D. R. M. Rajapakse.

Class 2.—M. L. Mohamed Ali, R. S. D. Jansz, T. J. Jayarettnam, S. Sinnathurai, T. V. Thamotheram, and E. T. W. Wijeyanayaka.

Pass List.—V. C. A. de Mel, J. de Zilva, S. P. Fernando, L. W. Mendis,* and A. C. W. Sirimane.

Partial Certificate.—W. P. de Silva, A. H. Hashim, R. S. Payson, and R. R. Senanayake.

* Excluding estate accounts.

1920–22 English Class.

Of nineteen men in this class, one was discontinued in August for unsatisfactory progress. The remainder have worked well.

1921–23 English Class.

In May twenty students were admitted to the full course. During the year six were withdrawn, one to join the Law College, the rest being below educational qualifications and not being able to do the work. This course will terminate in March, 1923.

1921 Class of Vernacular Teachers.

In May twelve teachers were sent up for training by the Education Department as follows :—

	Second Class Trained Teachers.		School.		Third Class Certified Teachers.		School.
1.	Perera, G. A. G.	..	C/Gehenuwela *b.*	7.	Gunatileke, D. C.	..	A/Eppawela *m.*
2.	Ranasinghe, D. A.	..	C/Tihariya *b.*	8.	Abeyakoon, M. G.	..	K/Attanurichchana *b.*
3.	Weerakoon, M. W. R.	..	K/Kobbekaduwa *m.*	9.	Simon, S. D.	..	K/Giraulla *b.*
4.	Dissanayake, D. B.	..	K/Keulgama *b.*	10.	Perera, S. M. J.	..	K/Madugalla *b.*
5.	Amunugama, T. B.	..	A/Kendawa *m.*	11.	Banda, P. U.	..	K/Mahamedagama *m.*
6.	Jayasena, H. G.	..	G/Kataluwa *b.*	12.	David, P. N.	..	K/Nugawela *b.*

These men followed the one year's course of instruction given to previous classes of teachers, and are due to complete their training in March next.

1921 Course for Headmen.

In May twelve headmen were admitted to an eight-months' course of instruction upon the lines of previous courses for headmen. These headmen are as follows :—

Sinhalese.

		Office.	District.
1.	R. Wickramanayaka ..	Vel-Vidane Arachchi ..	Chilaw-Puttalam
2.	R. H. Gunawardena ..	Police Officer ..	Galle
3.	P. A. Meththasena ..	Arachchi ..	Anuradhapura
4.	W. T. Ellawala ..	Korala ..	Ratnapura
5.	D. P. Rajapakse ..	Police Officer ..	Colombo
6.	Y. M. U. A. Banda ..	Korala ..	Nuwara Eliya
7.	S. M. D. P. Wijegunaratne ..	Police Vidane ..	Kalutara
8.	D. J. Abeygunaratne ..	Vel-Vidane ..	Matara
9.	T. B. Y. Rambukwella ..	Registrar ..	Kandy

Tamil.

10.	M. Kanagaretnam ..	Clerk, Irrigation Department ..	Batticaloa
11.	K. Thambirajah ..	Clerk, Kachcheri ..	do.
12.	T. Canagaretnam ..	Police Headman ..	do.

Three of them suffered greatly from malarial fever ; two of them being absent for prolonged periods, necessitating an extension of the course in their cases to March, 1922.

The Sinhalese headmen took the course with the teachers' class, with slight modifications.

The Tamil class was given a four-days' tour to Anuradhapura and Jaffna Districts.

Seven men completed the course which terminated in December, the following awards being made:—

1.	T. Canagaretnam	Silver Medal and Certificate
2.	R. H. Gunawardena	Bronze Medal and Certificate
3.	T. B. Y. Rambukwella	do.
4.	W. T. Ellawala	
5.	M. Kanagaretnam	Certificate.
6.	K. Thambirajah	Certificate.
7.	R. S. Wickramanayaka	Certificate.

D. P. Rajapakse was absent on sick leave from the final examination, and will appear for an examination in March.

D. J. Abeygunaratne, P. A. Meththasena, and S. D. P. Wijegunaratne having failed to secure a sufficient percentage on attendance, have been required to attend for a further period from January to March before a certificate can be issued to them.

Saturday Lectures.

The Saturday lectures in agriculture to students of the Training Colony, Peradeniya Junction, were given during sessions throughout the year by Mr. C. Wickramaratne.

Passed Students.

An inaugural meeting of the old boys was held on September 25, 1920, over which the Director of Agriculture presided, with the object of forming an Old Boys' Union. A committee for framing rules, &c., was elected.

On prize day of 1921, September 24, the first annual gathering of the Old Boys' Union was held, and the occasion celebrated by a lunch. The Director presided at the function, and among the guests of the Union was the Chief Justice, Sir Anton Bertram. On the next day, a full and representative meeting of Old Boys was held. The Director again presided. A working committee was elected, and resolutions adopted.

Miscellaneous.

The annual tour of the school commenced on February 21 evening, and ended on February 27 morning. The places visited were in the Anuradhapura and Jaffna Districts, and a strenuous programme was successfully completed. One morning was spent in visiting Sir William Twynam's Museum at his residence at Jaffna. The Divisional Irrigation Engineer, Anuradhapura, and the Jaffna Maniagars were especially helpful. The main topic of the tour was cultivation under irrigation. A collection of soils was made.

Visitors to the school included Mr. D. H. Grist of the Federated Malay States Agricultural Service, Mr. L. K. Elmhirst of Cornell University, the Rev. P. Rangaramamejam of the Students' Christian Association for India and Ceylon, and Dr. Bridger, the Sanitary Commissioner for Ceylon.

Outings were arranged for students to the tractor trials at Clovis estate, Kurunegala ; the Gampaha pageant and show ; the Peradeniya chocolate factory ; the tea and rubber factories of New Peradeniya estate ; the Milapitiya market gardens ; the Kandy market and slaughter-house.

In February the fifth number of the " Peradeniyan " was published.

On September 8 the new school laboratory was fitted with furniture made exclusively in the Bogambra Jail.

On September 24 the fourth annual prize giving of the school was presided over by His Excellency Sir William Manning, who declared the new school building open ; and Lady Manning gave away the awards.

Sir Anton Bertram was the chief speaker. He had declared the school open in its temporary buildings in 1916. The day was marked by the establishment of the " Governor's Prize."

Farm.

The following report on the operations of the Farm attached to the school is furnished by Mr. J. C. Drieberg, Farm School Officer:—

Paddy.

Harvesting of the 1920 maha crop took place at the end of February and in the middle of March. The variety sown was Hatiel, good seed of which was obtained from Mr. W. Molegodde.

In the upper portion of the field the paddy was transplanted, half bushel having been put down in the nursery. The outturn of the whole area, which was approximately nine-tenths of an acre, was 42 bushels 10 measures of grain and 590 bundles of straw. The lower area was broadcasted with half bushel Hatiel. The area of the block was approximately half acre, and the outturn 10 bushels of grain and 185 bundles of straw.

No yala sowing took place. The field was reconstructed, with the idea of securing four equal blocks of quarter acre each. The old bunds were broken down and new ones erected.

The 1921 maha sowing took place in September. Three blocks were green manured at the rate of 2,000 lb. of green leaves per acre on July 29 and 30, and immediately ploughed.

Artificial manures were applied on September 2 and 3, and transplanting took place on September 9, 10, 11, and 12. The nursery was sown on July 30 with half bushel of Hatiel seed obtained from the Experiment Station, Peradeniya.

The seedlings were selected, and put down on the system of single seedlings 6 inches apart either way. The crop is due to be harvested by the end of February.

The area of the upper part of the field is approximately one acre. The lower area, approximately quarter acre, was broadcasted with half bushel of Mudukiriyal on October 18, and is also due to be harvested by the end of February, 1922.

Iron ploughs are regularly used in the field. All operations are carried out by the students.

Students' Plots.

The crops sown in November–December, 1920, were harvested in February–March, 1921.

The plots are under a regular scheme of rotation, and a small quantity of cattle manure is given only to the vegetable crop.

In 1921 the plots were sown in June and harvested in September, and resown for the north-east season in November and December.

The crops that have been sown during 1921 are—

Cereals.—Maize (Hickory King) ; sorghums (4 varieties obtained from Jaffna) ; millets (kurakkan, amu, mineri, and tanahal).

Legumes.—Soy bean, black gram, cowpea, lima beans, groundnuts, and varieties of beans.

Vegetable Crops.—Bandakka, chilli, tomato, onions, ginger, and turmeric.

General Crops.

(*a*) Varieties of plantains are being grown, and were put down in May, June, and August. These were obtained from the Eastern Province, Jaffna, Anuradhapura Experiment Station, and Rambukkana.

The following varieties have been set down :—Idarai, kadali, mondan, kappal, alukehel, ambul hondarawala, suwandel, kolikottu, anamalu, marthewalu.

(*b*) In July 120 plants of the following varieties of coffee :—Arabica, Klainii, Quillon, Arnoldiana, Robusta, and Hybrid were obtained from the Experiment Station, Peradeniya, and now occupy the slope of the hill above the well.

(*c*) Eleven named and four unnamed varieties of sweet potatoes procured from the Government Stock Garden were planted out by the students in separate beds for varietal tests, and made very good growth.

(*d*) Five varieties of manioc were grown, and they did well.

(*e*) Ten varieties of crops suitable for green manure purposes were grown by the students in separate blocks. They were sown a little out of season, with the result that some of the varieties did not show much growth.

(*f*) 1,750 shoots of Kew and Mauritius pineapples were obtained from Anuradhapura and Rambukkana, and put down in July and August on the slope below the new estate road.

Rubber Area.

All the tea that stood between the rubber in the block behind the Assistant Farm School Officer's quarters was removed, and 150 rubber trees which were unfit for tapping were cut out.

Tea.

A small stretch of tea above the road was pruned in September, and an attempt will be made to maintain this in as good a condition as possible.

Roads.

The trace of a road to run through the estate was made by students in 1920 ; the work of cutting was commenced on December 15, 1920, and completed on January 31, 1921. The total length of work done by the school labour force was 1,000 feet, and the amount of cutting was approximately 400 cubes of soil. Under direct supervision this was effected at the low cost of Rs. 200.

AGRICULTURAL INSTRUCTION.

The importance of instructional work has been kept in view, and addresses on Chief Headmen's division days, at meetings, at school gardens, and demonstrations in the field have been arranged for frequently by Inspectors and Instructors.

In order to assist officers in this work, the beginnings of a miniature reference library for the division have been made with the collection of a few reference books on agriculture.

SCHOOL GARDENS.

The number of registered Government school gardens at the beginning of the year was 136, as follows :—

Kandy District	..	55	Kegalla District	..	28
Matale District	..	16	Province of Uva	..	23
Nuwara Eliya District	..	14			

The number of registered grant-in-aid school gardens was 22 :—

Kandy District	..	4	Kegalla District	..	10
Matale District	..	4	Province of Uva	..	1
Nuwara Eliya District	..	3			

A distribution of vegetable seed was made to all schools in October, and many schools have been supplied with flower seeds, plants, and cuttings.

Six newly registered school gardens were furnished with sets of tools during the year from funds voted by the District School Committees, and additional tools were supplied to fifteen school gardens from the small divisional allocation. The District School Committee vote was Rs. 425 ; the Departmental vote was Rs. 475.

All school gardens are inadequately equipped with implements, and it is satisfactory to note that a considerably larger vote has been allowed for the supply of tools during 1922.

Awards to the value of Rs. 550 were distributed amongst deserving school and home gardens :—

		Rs.			Rs.
Kandy District	..	245	Kegalla District	..	125
Matale District	..	10	Province of Uva	..	110
Nuwara Eliya District	..	60			

During the year at least one inspection was made to each school garden by the Inspector, and the Divisional Agricultural Officer frequently visited schools when on circuit.

Very creditable school gardens' work is being carried on by the majority of schools, particularly in the Kandy and Kegalla Districts, where climatic conditions are all in their favour.

Matale District is in need of special attention to bring the school gardens to a satisfactory state of efficiency. To some extent they are handicapped by climatic conditions.

CO-OPERATIVE SOCIETIES.

The control of co-operative societies in the Central Division was taken over by the Assistant Registrar from December 1, 1921, with the assistance of an Inspector of Co-operative Societies for the division, and with the passing of the new Ordinance, No. 34 of 1921, it is anticipated that there will be an early improvement in the progress of the co-operative movement, which has in the past been slow in the Central Province, owing to the lack of official support and to the indifference shown by the majority of village headmen.

Four new societies have been registered during the year, and the registration of one society has been cancelled, thus bringing the total number of societies to 26.

In the twenty-six societies in this division there are over 2,100 members with a paid-up capital of about Rs. 15,600. This works out at an average of about eighty members per society, and a capital of Rs. 603 per society and Rs. 6 per member.

FOOD PRODUCTION.

Food Production Committee meetings held in Kandy and Matale Districts have been regularly attended.

Agricultural Instructors have been largely instrumental in inducing villagers to utilize waste lands for vegetable production, and large supplies of vegetable seeds have been distributed for that purpose. They have also encouraged paddy cultivators to materially increase the area usually devoted to the yala crop ; and in the Kandy District to grow beans on those paddy fields which are not cultivated for yala.

Suggestions put forward by cultivators for the repair or construction of minor elas, small irrigation schemes, bunds, &c., have been investigated and reported upon, but the Divisional Agricultural Officer is, under existing arrangements, unable to devote anything like enough time to this work, which might prove so effective in bringing about increased food production.

The question of establishing Sunday fairs at likely centres, and thus providing improved facilities for the disposal of village produce, has been investigated with beneficial results.

Agricultural Instructors have been engaged upon the work of collecting village agricultural statistics to be indexed and filed for easy reference.

The following villages have been dealt with during the year :—

Kandy District.	Number of Villages.	*Matale District.*	Number of Villages.
Katugastota	35	South	69
Dumbara	3	East	16
Gampola	26	North	25
Nuwara Eliya District.		*Kegalla District.*	
Walapane	95	Kegalla	21
Uda Hewaheta	20	Ruwanwella	19
Kotmale	5		

Peradeniya, January 31, 1922.

G. HARBORD,
Divisional Agricultural Officer (Central).

SOUTHERN DIVISION.

The division has been divided up into areas, and assigned to Agricultural Instructors as follows :—

District.	Area.	Name of Instructor.	Station.
Galle ..	Four Gravets, Talpe	G. Seneviratne ..	Galle
Do. ..	Hinidum pattu and Gangaboda pattu ..	— ..	Hiniduma
Do. ..	Bentota-Walallawiti and Wellaboda pattu.	L. A. de Silva ..	Ambalangoda
Matara ..	Weligam korale and Morawak korale ..	H. C. Peiris ..	Weligama
Do. ..	Gangaboda and Kandaboda pattus ..	M. J. A. Karunayake ..	Matara
Do. ..	Four Gravets and Wellaboda pattu ..	B. G. Buultjens ..	do.
Hambantota.	West and East Giruwa pattus ..	N. Senaratne ..	Ambalantota
Do. ..	Magam pattu	— ..	Tissa
Kalutara ..	Panadure totamune and Rayigam korale..	D. T. J. Weerasuriya ..	Panadure
Do. ..	Kalutara totamune and Pasdun korale west	W. F. Seneviratne ..	Matugama
Do. ..	Pasdun korale east	J. C. Abeywardena ..	Agalawatta

In addition to these areas, Agricultural Instructor Senaratne is in charge of the Ambalantota and Kiula cotton plots and the Ambalantota dry grain plot; Agricultural Instructor D. T. J. Weerasuriya, the Bandaragama experimental plot; and Agricultural Instructor H. C. Peiris, the Borala experimental plot. These Experiment Stations are becoming very useful, not only for carrying out reliable experiments with existing and new crops and manures, but for the distribution of seeds to the surrounding villages. The cotton plots at Ambalantota (50 acres) and Kiula (10 acres) were planted with eight varieties of cotton during October, and, with the exception of Navassari Broach, a good stand of each variety has been obtained. Sea Island, Cauto, Cambodia, and Durango have especially done well. The plants are now in flower. Wild boar, elephants, and deer have proved rather troublesome, but the damage done up to the present is negligible. This experiment is being carried out on a cost of production basis.

School Gardens.

There are 135 registered schools gardens in this division, and 50 are now awaiting registration until they can be supplied with tools. It is hoped funds will be available next year, in order that those now awaiting registration may become fully equipped with implements. Seeds have been regularly supplied to the teachers of these school gardens. The number of home gardens attached to each school varies with the number of boys, size of school, from 50 to 150 per school. The various competitions held have been keenly contested, and should be continued.

Paddy Manurial Plots.

Five plots have been laid out for manurial experiments during this maha season, and are situated at the following places :—Tapugoda, Nugewela, Kokmaduwa, Bentota, and Usk Valley.

All expenses in connection with these plots are being kept, and the yields will be compared with non-manured plots in the same areas.

Agricultural Competitions.

The under-mentioned competitions have been decided upon, and will be held during the coming year :—

Vegetable Garden Competitions in the Four Gravets, Gangaboda pattu, Bentota-Walallawiti korale, Talpe pattu, Wellaboda pattu, and Hinidum pattu in Galle District. At the recent Food Production Committee meeting held at Matara, funds were promised for a similar competition in that district.

Transplanted Paddy Competition.—Prizes offered for the best plot in each pattu of the Galle District and Matara District. The advantages of transplanted paddy are gradually been realized by the goiya, especially in the Matara District, where for the first time in the history of Kandaboda pattu thirty-five plots and in Gangaboda pattu forty-one plots, have been planted this season, the extent varying from 1 to 4½ acres per plot. Also there are many more plots in the Weligam korale this year than in any other preceding year.

School Garden Competitions.—Galle District; Kalutara District from private donations.

Police Garden Competition.—Galle District.

Paddy Competition.—For best plot in Weligam korale. Prize given by Mr. E. W. Goonatilaka.

IRRIGATION.

There are about 2,000 acres of flooded lands in the Wellaboda pattu, and inquiries are being made in order to have this area brought under paddy cultivation. Also the widening of the sluice from the Kakandura tank, in the Naotunna district, to let off the surplus water, which in the past has caused considerable damage to the adjoining paddy fields, is under consideration.

FOOD PRODUCTION MEETINGS.

Food production meetings have been held at Galle, Kalutara, Hambantota, and Matara.

At a meeting of the Kalutara Food Production Committee it was decided to hold four Agricultural Shows during the coming year, instead of the usual competitions, and the one for Pasdun korale east has already been fixed for June 24, 1922.

At the Hambantota Food Production Committee meeting it was also decided to have an Agricultural Show in each of the Chief Headmen's divisions, three in all.

F. BURNETT,

January 31, 1922. Divisional Agricultural Officer (Southern Division).

NORTHERN DIVISION.

DURING this year the Northern Division was formed consisting of the Northern Province, North-Central Province, and the Trincomalee District of the Eastern Province, and placed under the charge of a Divisional Agricultural Officer, with headquarters at Jaffna. This division contains three Experiment Stations—the Dry Zone Experiment Station at Anuradhapura, a garden of 25 acres at Tinnevelly, Jaffna, and a small Experiment Station of 5 acres at Kanniyai, near Trincomalee.

GENERAL.

The work of this division during the year under review was divided into four main divisions :—

(1) Continuation of experiments at the Dry Zone Experiment Station, Anuradhapura, and the expanding of the area and improvement of this station.
(2) The formation of Experiment Stations at Jaffna and Trincomalee.
(3) District work (*i.e.*, lectures, demonstrations, and reports).
(4) School gardens.

LECTURES.

Twenty-five lectures were given during the year, chiefly connected with the growing of paddy and the use of green manures. Other lectures given were on White Burley tobacco, dry farming, and growth of fodder crops.

DEMONSTRATIONS.

A demonstration in ploughing was given at Vavuniya. Attendance at this demonstration was about eighty. The opinion of the cultivators was that the ploughing was good, but that the ploughs were too heavy and tired the buffaloes too soon. Arrangements are being made to secure a lighter plough, and another trial will be held.

A demonstration of ploughing by Hindustan plough was held at Pallai for cultivating coconut plantations. In this area cultivation is not usually practised, but owing to work in this area, over 400 acres of coconut plantations have now been cultivated and a soil mulch made.

PADDY MANURIAL TRIALS.

Results were obtained from nine experiments for the maha crop, 1920-21, and twelve paddy manurial trials have been laid down during the year in the Northern Division, with the object of demonstrating the benefit of using green manures and phosphates and fish manure.

CO-OPERATIVE CREDIT SOCIETIES.

At the beginning of the year there were twenty societies in the Northern Division, excluding the Sinhalese societies in the North-Central Province, which are not inspected by the Divisional Agricultural Officer, Northern Division.

Two new societies were formed during the year in the Jaffna District, namely, Kuddatanai and Chavakacheheri Societies. This makes a total of twenty-two Tamil societies, and satisfactory progress is being made by many of them.

SCHOOL GARDENS.

There are now thirty registered school gardens in the Northern Division, and four awaiting registration. Thirteen schools received prizes, eight first and five second prizes. Thirteen certificates were granted. Eight home garden awards and twenty-five certificates were awarded. Thirty schools received seeds, and to ten schools tools were supplied during the year. The schools in the North-Central Province were inspected by the Inspector of School Gardens, Mr. Alexander Sylva, the remainder by the Divisional Agricultural Officer, Northern Division, and his staff. The gardens in some cases showed improvement, but it is hoped to make better progress in future.

Prison Labour.

Prison labour has been employed during the year as an experiment on jungle clearing on a new area at the Dry Zone Experiment Station, Anuradhapura. The work of the prisoners was satisfactory, and 65 acres were tilled and 50 acres burnt, and a chena crop of paddy sown. The experiment has so far worked well, and it is to be hoped that it will be allowed to go on for another year. A special report on this subject has been made by the Director of Agriculture.

Special Reports.

A special report was made on the black cotton soil in the Tunnukkai area, Northern Province, with regard to its area and suitability for growing cotton.

A special report was made on the area near Nachchaduwa tank, North-Central Province, with regard to its suitability for forming a cattle-grazing area.

Dry Zone Experiment Station, Anuradhapura.

Paddy.—The plots previously used for "time of sowing" experiments were taken over early in the year by the Economic Botanist for sowing pure line paddies during the yala season.

Varietal Tests and Botanical Examinations.—The improvements on the lines laid down in the previous year's report were continued, and considerable progress made with such selected strains and varieties which had shown most promise in previous crops.

Manurial Experiments.—There seems to be a general awakening in the district to the necessity of increasing crop-production by adequate manuring. The use of green manure crops is rapidly gaining favour with villagers, and *Tephrosia purpurea* (pilla) and *Sesbania aculeata* (daincha), which grows wild in the district, is largely used.

Four demonstration plots belonging to private landowners, manuring with fish, superphosphates, &c., were conducted under the supervision of the manager of the station. It is too early to draw conclusions. Two plots in the recently reclaimed area on the station have also been manured with the following manures :—(1) Superphosphate, (2) fish guano. A control plot has also been established.

A paddy-growing experiment in three series was started in November to find out whether there is any difference in yield by (1) sowing seed in a nursery, (2) planting germinated seed 6 inches apart, (3) broadcasting at the rate of 1½ bushel per acre. Each plot was repeated three times a week later in each case.

New Land.—A further block of two acres has been brought under cultivation during the year. The re-adjustment of the areas of the fields 1–30 were undertaken.

Pests.—A swarm of caterpillars identified by the Government Entomologist as the swarming caterpillar (*Spodoptera mauritia*) attacked the paddy plants in the Economic Botanist's plots. Remedial measures taken immediately reduced the numbers in a very short time. Paddy fly increased in numbers during the months of July and December. Hand nets were employed to catch them.

Fibres Mauritius Hemp : (Fourcræa gigantea).—The plants have made excellent growth during the year, and are now ready for fibre extraction. A plant for extracting the fibre has been ordered from Mauritius.

Sisal Hemp (Agave rigida var. *Sisalana).*—Sisal hemp has continued to make good growth. The plants have thrown suckers very liberally, in spite of these being periodically removed. Nurseries of young plants have been established. Hand-beaten samples of fibre from both varieties were exhibited at the Matale and Galle Agricultural Shows.

Coconuts.—The trees have made satisfactory progress during the year, and are now arriving at an interesting stage in their development. Thirteen trees started to flower four years and six months from planting, and two trees have come into bearing. The land which is unirrigable was ploughed once in three months, and the trees weeded round.

Pests.—Attacks of the black rhinoceros beetle (*Oryctes rhinoceros*) have been successfully checked, only five trees being under treatment during the period.

Citrus.—The whole of the lime area has been planted up. The interplanted dhall has been uprooted, and the land clean weeded. The British Guiana lime plants gave a splendid crop. Baskets of ripe fruit were picked up every morning. A single tree yielded 1,021 fruits per crop. Seed of this variety was in great demand. The lemon, citron, sweet orange, tanjarine, seville orange, pomelo, and grape fruit gave excellent crops. The last two fruited for the first time.

Coffee.—The Robusta trees have yielded fair crops. Die-back and strong winds affected the trees to some extent. The Gliricidia shade over the coffee has been pruned down to 10 feet. The thorny dadap trees (*Erythrina indica*), which could not have been conveniently lopped and handled, were cut down, leaving the *Leucæna glauca* previously planted to take its place.

Oil Palms.—542 pounds of dry seed has been collected during the year, as against 102 pounds collected during the preceding year. Several orders for seed have been received and executed. The lower branches have been cut off, and the trees thoroughly cleaned. This was found necessary to admit light and air and to allow proper cultivation being carried on. A census of the trees has been taken, differentiating the black and green varieties. The red weevil (*Rhynchophorus ferrugineus*) was found attacking some of the palms. Pariah dogs, having cultivated a taste for the ripe fruit, became a serious pest.

Fruit Section.—Melons, Kew and Mauritius pineapples, mangoes, guavas, soursops, custard apples, mulberries, and oranges gave good crops under irrigation.

Miscellaneous Crops : Dioscorea yams.—One-fourth of an acre was put under this crop, and an acre yield of 4,396 lb. was obtained.

Manioc.—One-fifth of an acre yielded 1,787 lb. of tubers, or an acre yield of 8,935 lb.

Groundnuts.—This crop was grown on one-fifth of an acre, and gave a fair yield of 11 bushels, or an acre yield of 55 bushels. Rains interfered with the harvest, and much of the crop had to be left in the ground.

Arrowroot.—One-tenth of an acre yielded 840 lb. of tubers, or an acre yield of 8,400 lb.

Onions.—This was grown in a small plot, and gave good results. Three pounds of onion sets obtained from the bazaar yielded 30 lb. of clean onions.

Chenopodium.—This grew moderately well. A small plot has up to date yielded 9 lb. of dry seed.

Chillies.—These failed owing to December rains. The conversion of ripe chillies into dry resulted in 5 lb. ripe yielding 1½ lb. dry.

Sorghums.—The following varieties were grown during the year, and yielded good crops:—*Millet gattara*, *Millet Teseini*, *Millet ata*, *Millet Sebeini*, Pink Kafir corn, Dwarf Milo, Feterita and Dawn Kafir. Seed of the best heads were carefully collected for re-sowing. There was no sign of any disease, such as smut, stem-borer or aphis, but the crop was open to attack by parrots and monkeys.

Maize.—This did not do well even under irrigation.

Garden Crops.—The crops raised at the station this year were as follows:—Cumin, fenugreek, coriander, *Cicer aurantium* (horse gram), *Dolichos biflorus* (kollu), Bonevist beans, gingelly, dhall (yellow and white), Bush Lima, *Coix lachrymac-jobi* (Job's tears), arrowroot, fodder grasses, green and black gram, and vegetables. None of these call for comment.

Chena Experiments.—The following crops were raised during the year:—Maniocs, sweet potatoes, el-wi paddy, kurakkan, green gram, gingelly, and chillies.

Plants, seeds, and cuttings to the value of Rs. 110 have been issued gratis to Government institutions and villagers.

New Works.—During the year a third set of cooly lines were built, and is now in use. The foreman's quarters were completed. A cattle shed is in course of construction. The insanitary pond opposite the cooly lines has been partially filled up.

Visitors.—The number of visitors to the station during the year was 1,628. Several planters and visitors to the Island were shown round.

Weather.—The year was an abnormally wet one, 71·51 inches of rain falling during the year, as against 49·12 inches the previous year. The wettest months were October, November, and December, which together gave 37·92 inches of rain.

Labour.—The health of the labour force has been more satisfactory than the previous years. Quinine mixture and salts were regularly administered to all the coolies. Estate labour was difficult to procure.

Prison Labour.—One hundred prisoners with fourteen guards started work on the station at the end of May, felling jungle on the other side of the railway. They have so far cleared approximately 65 acres, of which approximately 50 acres have already been sown with a chena crop of paddy. The prisoners leave the jail at 6 A.M., reaching the station at 7 A.M., start work at 7.15 A.M., with an interval of one hour between 1 and 12 o'clock for breakfast, and cease work at 3.30 P.M. The work done has been very satisfactory.

EXPERIMENT STATION, JAFFNA.

The farm is situated at Tinnevelly, about 3 miles from Jaffna town. It is about 25 acres in extent, of which nearly 15 acres are under cultivation, the rest being taken up by roads, buildings, &c. Of these 15 acres, about 10 acres were under cultivation prior to its acquisition by Government. During the year under review the entire extent of 15 acres has been brought under cultivation.

Farm Improvements.—The fence work commenced in the previous year was completed. During the year the cultivable area was laid out into plots of convenient size, and skeleton roads were formed. The construction of portions of the two central roads and one side road was completed, while the rest of the work will be pushed on during the current year. Tulip trees which were planted round the farm along the wire fence are growing well.

Two buildings have been erected by the Public Works Department, viz., the Farm Manager's quarters and the dairy buildings. The construction of the Farm School Officer's quarters and a temporary cooly line was commenced, and the work is progressing.

A well was dug in the northern block, and about 32 feet was reached. The water supply is insufficient, and further deepening of the well will be resumed.

Implements.—Besides the two Hindustan ploughs which were in use on the farm ever since it was started, a pony plough was purchased during the year, and some new implements have been ordered from Madras. The pony plough has been tried, and it is working satisfactorily. A Chaine Helice elevator was also purchased and installed. It is now under trial with a 2½ horse-power engine.

Live Stock.—Besides the old pair of work cattle, a new pair was purchased during the year to cope with the increasing work on the farm.

Crops: Tobacco.—The 1920 crop, White Burley tobacco, amounting to 1,233 lb., was sold in London at 1*s*. 4*d*. a lb. About 8,000 plants of White Burley were grown on the farm. Besides this, about 3,000 plants were purchased from cultivators and cured along with the farm crop. The total yield of dried leaves of the farm and cultivators' tobacco is 650 lb. and 500 lb., respectively.

Kurakkan Variety Test.—An interesting kurakkan variety trial was conducted during the year. Special report submitted.

Tenai or Italian Millet (*Setaria italica*).—It was sown mixed with green gram in March, and harvested by the middle of June. It gave as much as 505 lb. of grain per acre. The yield of green gram was very disappointing.

Fodder Crops: Cholam (*Andropogon sorghum*).—An important fodder crop was introduced this year. It was sown in an area of one acre as an irrigated crop about the end of March, and harvested about the middle of July. The crop grew well, and showed no prospect of flowering. Consequently it was cut, and about 7,000 lb. of straw was obtained, which was sufficient to feed the farm cattle for three and half months. The crop was certainly a success as a fodder crop, and is the most economical fodder to grow for the farm cattle. An attempt is now being made to grow sufficient fodder of this on the farm to feed the farm cattle.

Periyamanjal Cholam (large yellow), a variety of standing reputation as a heavy yielder of both grain and straw in the Madras Presidency, was sown with the rains late in the year as a fodder crop in an area of about 1½ acre. The results are therefore not yet available, though the crop is now in full ear and promises to yield straw and grain of good quality.

Guinea Grass, Sudan Grass, and Lucerne are now being tried tentatively in small plots. Guinea grass was planted about the middle of November, and the crop is progressing well. Sudan grass has grown well during the monsoon. It has tillered well, and a heavy cutting is expected.

Karuthasami (*Panicum milaceum*), an important fodder crop of the locality, was sown in October as a catch crop amidst dhall in F. 1. It was cut green during the months of November and December, and about 3,275 lb. of fodder was obtained. A late sown crop of karuthasami in an area of two acres yielded about 3,500 lb. of straw.

Cowpeas are being grown along the bunds to remove temporary scarcity of green fodder during the months of February and March. Owing to the well-distributed showers in the latter part of the year about 8,500 lb. of farm grass was cut and given to the cattle as fodder.

Andropogon sorghum.—Variety test. Four American varieties of sorghum were grown early in the year for comparison, and their yields are as follows :—

	Name.	Date of Sowing. 1921.	Date of Harvest. 1921.	Yield per Acre. Grain in lb.	Straw in lb.
1.	Feterita	February 21	June 12	1,650	16,000
2.	Dwarf Milo	do.	do.	1,200	11,600
3.	Dawn Kafir	do.	do.	850	19,200
4.	Pink Kafir	do.	do.	900	14,700

Manioc.—This was planted early and late in the year. Manioc which was planted early in the season is ready for lifting, while cuttings of the four varieties which were received from Peradeniya were planted in four plots of one-eighth of an acre each to test the relative merits of horizontal *versus* vertical planting.

Cambu (*Pennisetum typhoidieum*).—The crop seems to be suited to the conditions obtaining here. It was sown broadcast early in October. The germination was good. The crop grew well and flowered uniformly. It is now in full ears, and will be soon ready for harvest.

Maize (*Zea mays*).—An area of about half an acre was sown early in November with three introduced varieties, Hickory King, small dent, and large dent. Germination was good. The crop has grown well, and an excellent yield is expected.

Cotton.—Cambodia, an irrigated cotton, was introduced this year. The seed was obtained from Coimbatore, Madras, and sown in the latter part of October with the rains of the north-east monsoon. The crop is now flowering. Two indigenous varieties of Indian cotton—Karunganni and Sahilla—were received and sown in the latter part of November. They are progressing well.

Onion (*Allium cepa*).—This crop was planted in the latter part of the year. The results of the comparative plots to test ridge against flat bed planting are therefore not available.

Plantain Varieties.—Suckers of twelve varieties of plantains collected from various localities of Jaffna District were planted in an area of about one acre. The crop has greatly improved with the rains during November and December.

Fibres.—Mauritius hemp (*Fourcræa gigantea*) and Sisal hemp (*Agave rigida* var. *Sisalana*) were planted with the initial rains early in October. The plants have established, and have made good progress with the late rains.

Groundnuts.—The crop which was sown early in November has completely covered the soil, and promises to give a good yield.

Chillies.—A plot of about one-fiftieth of an acre in extent was planted with chillies in March and 11 lb. of dried chillies were obtained. A crop of chillies was planted in the latter part of December. The crop has established itself, and is faring well.

Miscellaneous Crops : Dhall.—The crop which is now in flower is far below the ordinary.

Yams.—A collection of six varieties of yams was planted in May. The crop is doing well, and will be soon ready for lifting.

Sweet Potato.—This was planted in portions early and late in the season in an area of about one-twentieth of an acre. The crop will be ready for lifting in another month.

Experiment Station, Kanniyai, Trincomalee.

The area of this station is 5 acres. During the latter part of the year 1920, the station was sown with chena crops of el-wi paddy, kurakkan varieties, green gram, and maize varieties, and these crops were harvested during the early part of 1921.

The el-wi paddy failed owing to lack of seasonable rain. The kurakkan and maize crops gave better results, but suffered heavily by being washed away by floods.

After the above crops had been removed, the chief work was the removal of a large bund of an old tank which ran across the centre of the station, the extraction of stumps of trees, and the general levelling of the station and laying out into suitable size blocks for future cultivation.

During October these five acres were again sown with a catch crop of paddy, maize, kurakkan, and vegetable crop.

N. MARSHALL,
Divisional Agricultural Officer (Northern Division).

January 30, 1922.

AGRICULTURAL INSTRUCTORS CONTROLLED FROM HEAD OFFICE PENDING FURTHER DECENTRALIZATIONS.

Western Province.

The following extracts are taken from the report of Mr. A. B. Attygalle, Agricultural Instructor, Veyangoda :—

The chief work done during the year was in connection with cultivation of paddy and other food crops. Special efforts were made to encourage paddy transplanting, use of artifical manures, green manures, and the results achieved are to be seen in the large number of cultivators who have manured their fields during last yala and this maha season. The use of farm yard manure and green manure, too, has been appreciably extended.

During last yala and this maha season the cultivators were encouraged to bring the largest extent on record under cultivation, with the result that the output of paddy was increased to a very appreciable extent.

During last maha season a series of important experiments were made with artificial manures. It is difficult to pronounce any decided opinion on the experiments, as the plots were damaged by floods. In most cases there was a marked difference between manured plots and control plots.

Paddy transplanting experiments were first started in 1920 on a small scale, and the results achieved were very encouraging. Now transplanting of paddy is adopted by cultivators to a fairly appreciable extent. A paddy transplanting competition was started in Uruwala peruwa (Siyane korale west) for this maha season, and the results are very good. The cultivators are convinced by the demonstrations carried on at different centres, and transplanting will be generally adopted in the next season. A detailed account of the competition will be available by the end of March (after harvest).

Transplanting was closely supervised with the object of inducing cultivators to use less seedlings and plant at regular distances. The amount of seed paddy was very much reduced, and a half bushel of selected seed is used to raise seedlings to transplant in one acre.

Attention was given to selection of seeds. Cultivators are realizing the advantages of this.

Special efforts were made to encourage garden cultivation. A competition is started in this season for Siyane korale west.

About hundred acres of land are being asweddumized in the district during this season. Attention was given to the restoration of anicuts and tanks, but several irrigation works are being held back for want of assistance.

Special efforts were made to organize Co-operative Credit Societies. Arrangements are being made to start a Co-operative Bank at Mirigama and organize small societies at different centres in Hapitigam korale.

Lectures and demonstrations were given at Co-operative Credit Society meetings. The Uruwala Peruwa Co-operative Credit Society is doing good work. Credit must be given to the energetic President, Mr. Peter Weerasekera. Attention was given to school and home gardens. Lectures and demonstrations were given to school children, and the results achieved can be seen by the improving standard of work in school gardens.

North-Western Province.

The following extracts are taken from the report of Mr. A. C. W. Jayawardene, Agricultural Instructor, Kurunegala :—

The most noticeable defect in the cultivation of the district is the lack of attention to proper ploughing, which is due to the fact that cultivators undertake to work larger areas than they can actually attend to. I have made every attempt to make them give more consideration to this important step, personally watching and instructing during the ploughing season.

The competition arranged for the Province will help to remedy this defect.

Manuring is taking some hold in the district, several plots in close proximity to those places where the manuring experiments were carried on have been manured. The vastness of the areas under paddy cultivation has rendered the introduction of paddy transplanting a very difficult task. The offer of a prize for the best transplanted plot was rejected at a meeting of the Food Production Committee, as it was thought that such a step would be premature.

School Gardens and Home Gardens.—The condition of school gardens in the Kurunegala District is very satisfactory, and has recently greatly improved. The offer of prizes by Lieutenant-Colonel T. Y. Wright no doubt helped to encourage them. There has been constant demand for seeds from the villagers, and the teachers have not been slow to answer them. The one and only method of introducing transplanting permanently into the villages will be by instructing the advanced students with practical demonstrations in plots attached to the school. Such work is already been done at the Ballale and Nakkawatta schools. The home gardens are also in a very satisfactory state, the competitions have infused energy into the boys, and some very fine gardens have been established. The judging for the Pilessa school home gardens took place in December. The prize of Rs. 10 to the best home garden has been sent to the Ratemahatmaya, Weudawili hatpattu. The donor of this prize is the Hon. Mr. T. E. de Sampayo.

Dhall.—The success of the dhall cultivation in the Dambadeni hatpattu has prompted me to take more than ordinary interest in its cultivation throughout the district, and specially in the Wanni hatpattu, whose people no doubt deserve special consideration on account of the fact that they live under very adverse conditions. A concentrated effort should be made to encourage the cultivation of dhall.

Plantains.—An experimental plot in plantain cultivation has been conducted on a plot of land allotted by Mr. P. Thambirajah, Proctor, the place is regularly weeded, and no stumps are allowed to remain on the land.

The following extracts are taken from the report of Mr. P. A. Gooneratne, Agricultural Instructor, Dandagamuwa :—

Paddy Transplanting.—I have been unceasing in my attempts to demonstrate the benefits of transplanting over the broadcast system, and have met with appreciation all round. But it is due to the villager that I should here record my impression that here a larger adoption of transplanting under present village conditions is almost impossible. The soil in most paddy fields is sandy, rains uncertain, and with other ways of supplementing the same totally absent, the villager, faced with possible failure of his crop, is inclined to take as little risk as possible, and content to lose his paddy sown with the least possible labour.

Demonstration Ploughings.—I held two ploughing demonstrations at Moragane and Bingiriya, respectively, in the presence of fairly large gatherings.

Paddy Fly Pest.—The villagers generally realize the damage done by the paddy fly. I demonstrated the possibility of combating the fly pest by the introduction of nets and other control measures.

Curry Stuffs.—I have been endeavouring to instil into the villagers the utility of attempting the raising locally of the necessary curry stuffs, at least sufficient for the consumption of each village, and with this object in view, I have interviewed the school population of the different schools, distributing seeds among them, with practical hints as to sowing, cultivation, and subsequent care, much to their interest and through them to the villagers generally.

Demonstration Gardens, Dandagamuwa.—This demonstration garden has improved. The villagers are unceasing in their visits and evincing an interest in the work done. The dhall plot has been very successful, and constant demands are made for seed.

Province of Uva.

The following extracts are taken from the report of Mr. J. Arthur Rambukpota, Agricultural Instructor, Badulla :—

Paddy.—Every effort was made to impress on the headmen and cultivators the benefits that could be derived from improved methods of cultivation, green manuring, transplanting, and seed selection. At every meeting and during my rounds of circuit, the necessity of producing more food was urged.

The application of green manure is now spreading throughout the Province, and very good results have been obtained through its application—practically in almost every range of paddy fields where the return is poor this has been started. Cattle manure is now more largely used, specially in Udukinda division, where almost every cultivator makes some application of this manure.

Transplanting has been started in different places, and in Badulla several cultivators have taken it up. At Meegahakeula three-eighths of an acre transplanted with Murunga-wi paddy, introduced from Wellassa division, gave a yield of 60 bushels of paddy A field was transplanted in Bintenna division by S. H. Heen Appu, and two fields in Wellassa division by the Ratemahatmaya. These gave very good yields. The difficulty in carrying out transplanting in divisions like Wellassa, Bintenna, Buttala, and Wellayawa is that there are no men in these divisions to work even the available area under cultivation, and that only in exceptional cases people can be induced to take up transplanting. In Yatikinda, Wiyaluwa, and Udukinda divisions this is being successfully carried out, and it is now gradually spreading. This season, in ranges close to Badulla town, eight fields have been transplanted.

Manurial Experiments —Experiments conducted with artificial manure gave good results. These were confined to ranges of fields in Badulla town. Two more experiments are now being conducted. Cultivators are now realizing that through artificial manure good yields can be obtained, and that there is now no difficulty in inducing them to take up artificial manure supplied free by Government.

Competitions.—Prizes were given for the best transplanted fields in each Ratemahatmaya's division, for the best vegetable gardens in Yatikinda and Udukinda divisions, and for the best chenas in other divisions ; and also a special prize for the best potato garden in Udukinda division.

Miscellaneous.—The cultivation of curry stuffs, potatoes, and beans were encouraged—there is an increase in the cultivation of garlic and shallot in Udukinda division.

Cassava and sweet potatoes are now largely grown in gardens, and in almost every chena in Bintenna division.

There is an increase in chena cultivation throughout the Province. All surplus stocks of kurakkan, maize, and chillies from Wiyaluwa and Bintenna divisions are sent up to town, where they have a ready sale.

An experiment of about an acre with tobacco is now being conducted at Taldena.

No serious pests appeared in any part of the Province during the year.

Province of Sabaragamuwa.

The following extracts are from the report of Mr. L. A. D. Silva, Agricultural Instructor, Ratnapura :—

Experimental Gardens.—There are two gardens in the district, one at Balangoda and the other at Godakawela. These gardens have made very satisfactory progress during the period under review. *Coffea Robusta* is doing very well in both gardens. Seeds are being supplied by these gardens among the villagers to encourage its cultivation in the house gardens. At Godakawela cinnamon and citronella have been very successful. Different varieties of yams and vegetable seeds are raised in the two gardens and distributed among the cultivators.

Village Agriculture.—I have often instructed the villagers with regard to improved methods of paddy cultivation, such as transplanting, manuring, weeding, &c. In the course of the last maha cultivation a series of experiments have been conducted by me by transplanting and using different manures. These experiments have succeeded in rousing the interest of the cultivators to a great extent, and this new system is gradually taking hold in the district.

Acting under my instructions the villagers are growing food crops other than paddy, where the latter is not likely to prosper satisfactorily. During the period under review, agriculture in this district has made considerable progress, and there is now a large increase in the output of all food products.

With the help of the vel-vidanes the channels, anicuts, and small tanks have been repaired, with the result that the yield of paddy has increased. Extensive areas hitherto uncultivated have gradually been brought under cultivation.

Circuits.—I have frequently gone into most of the villages and addressed the people with regard to the improvement of village agriculture and the growth of food products, emphasizing the advantages of co-operation. In these circuits I have distributed *Coffea Robusta* berries among villagers.

Tobacco Cultivation.—As a result of the tobacco experiment carried on at Pallewela two years ago, I am glad to mention that its cultivation is gradually increasing.

With a view to introduce the cultivation of *Coffea Robusta*, I have applied for a supply of seeds from the Department to be distributed among the villagers for cultivation in their house gardens. I have also instructed them as to its cultivation.

The following extracts are from the report of Mr. George Madugalle, Agricultural Instructor, Godakawela :—

As Agricultural Instructor I was in charge of Atakalan korale and Kolonna korale, with an experimental garden at Godakawela.

As cultivation officer I was in charge of the distribution of water for paddy cultivations from major and minor irrigation works of Atakalan and Kolonna korales in Ratnapura District.

Villages were visited frequently by me, and instructions were given on the improvement of village agriculture and on the improved methods of paddy and garden cultivations, and also on the advancement of co-operative work in the district.

Several experiments in manuring and transplanting were carried out during the yala season, 1921. The experiments for maha, 1921, were under cultivation. The artificial manures were advanced by the Godakawela Co-operative Credit Society to its members. Non-members experimented with farm yard and green manures. The results of artificial manure were not quite satisfactory in all cases. There are prospects of transplanting and manuring being carried out in the district with the aid of the Co-operative Credit Societies. Kolonna korale is rather slow in taking up improved methods of cultivation. I understand that the inhabitants of Kolonna korale prefer chena cultivations to any other, as these chenas supply many of their necessaries, such as kurakkan, Indian corn, other fine grains, vegetables, chillies, cassava, and sweet potatoes.

Home gardens are satisfactory in both korales, Atakalan korale being better of the two. The gardens were also frequently visited by me. I have found that the gardens were cultivated with a certain amount of understanding. Vegetables were cultivated in abundance.

Chenas were felled in both korales to meet the food supplies of the korales. Chena cultivations are more carefully done than any other cultivation. The crops are always satisfactory. The chena produce maintains the inhabitants with food supplies for several months of the year.

Since the recent food crisis the cultivators are paying more attention to their agricultural work. An increase in chena cultivation is always seen. Paddy cultivations are more carefully done than in the previous years. Vegetable gardens are on the increase.

Marketing of village produce is rather difficult. Access to villages is not satisfactory. As a result of these difficulties, the producers get a very poor profit. The middleman in all cases makes a profit. If the village roads are better constructed and Village Committee markets established, I am full confident of the advancement of the district. Lack of these facilities, however, has kept back agricultural improvement.

As cultivation officer, all major works were visited monthly in Atakalan and Kolonna korales. The distribution of water was carried through the aid of the vel-vidanes to the satisfaction of the cultivators. Reports *re* constructions of sluices and opening of channels were made to the Government Agent, Province of Sabaragamuwa.

Asweddumizing is carried out successfully at Embilipitiya in Kolonna korale. The cultivators were given all help to carry out their work.

A seed store and a cooly line was built for the Godakawela Experimental Garden. Sweet potato cuttings and seeds were distributed to cultivators. The visitors to the garden have shown interest in the work of the garden.

Coffea Robusta is likely to be cultivated extensively in Atakalan korale. Several plots were arranged and nurseries put in. The plots opened are satisfactory.

Tobacco cultivation was again successfully carried out at Mahagama. This would be carried out regularly at Mahagama village.

A Co-operative Credit Society was organized at Kahawatta on May 2, 1921. Both Godakawela and Kahawatta Societies are working satisfactorily. The members of two societies have realized the advantages of these societies. The two societies have been established for the whole of Atakalan korale and a part of Nawadun korale. The support of the chief and minor headmen in connection with these societies has been excellent. The office-bearers of both societies have executed their duties to the best of their ability. Godakawela Society has secured a loan of Rs. 1,000 from Government.

The following extracts are from the report of Mr. Walter Perera, Agricultural Instructor, Kuruwita :—

It is gratifying to note that nearly 250 acres of land have been asweddumized, and over 300 acres of fields which were abandoned have been taken up for paddy cultivation again in Kuruwiti korale.

Lectures were given to villagers as regards green manuring and transplanting in paddy cultivation.

Several arrangements have been made for green manuring and transplanting paddy trials during next maha season.

I have drawn the attention of cultivators to the unsatisfactory condition of irrigation channels, and improvements in this direction have been effected.

Most of the fields are sown only once a year in both these korales, although water is available. I am inviting the attention of cultivators in order to get these fields worked during both seasons, but only a few cultivators so far have agreed to work their fields during both seasons.

Cassava is generally cultivated, and commands a ready sale.

Sweet potato is grown satisfactorily, but not extensively. Other kinds of yams are not widely grown. I am attempting to introduce new varieties.

There has been a marked increase in the area under vegetables when compared with the past in Kuruwita korale.

Eastern Province.

The following extracts are from the report of Mr. N. Thambiah, Agricultural Instructor, Batticaloa :—

The agricultural progress of the district for the year 1921 was on the whole very satisfactory. Extensive areas were leased out for food production, mainly paddy cultivation, under the different tanks, and lands that were once cultivated and latterly abandoned were once more brought under cultivation in different parts of the district. Another item of agricultural interest is the formation of a Paddy Bank, the first of its kind in Ceylon, by the Government Agent, which has been of much assistance to the paddy growers, and has given an impetus to paddy cultivation in the district.

Agricultural and Industrial Show.—This Show was held on April 29 and 30, 1921. All agricultural and industrial sections were well represented. The chief features of this Show were (1) a weaving demonstration by the Education Department; (2) a demonstration on ploughing by Fordson tractor by Messrs. Brown & Company, Limited, Colombo.

Both the demonstrations were declared successful. As a result of the former, two weaving schools have been started by the Government Agent and a cloth society formed locally. The weaving schools and the works of the cloth society are fraught with great prospects for the regeneration of an important industry.

Vegetable Cultivation.—A large quantity of vegetable seeds (bandakka, brinjal, chillies, cucumber, tomatoes, pumpkins, snake gourd, bottle gourd, bitter gourd, &c.) have been distributed all throughout the district gratis, and I note that the number of vegetable gardens is on the increase, particularly in the following villages :—Suthurukundam, Kokuvil, Araipathai, Neelanennai, Cheddipulayam, Kurukalmadam, Pandiruppu, Eruvil, &c. The few cash prizes that were given to police headmen during 1920 for the best vegetable garden among the headmen of every pattu have been partly responsible for more gardens. No prizes were given during 1921 owing to want of funds. I have visited most of the villages in the district, inspected vegetable gardens, and given instructions regarding the proper methods of cultivation, manuring, seed selection, &c. Pamphlets were distributed during the year for vegetable garden competition, and I have received names of many competitors. Some of these gardens were inspected and instructions given.

Coconut Cultivation.—The coconut cultivation of this district is seriously affected by the three insect pests—(1) the black-headed coconut caterpillar (*Nephantis serinopa*), (2) the black beetle or rhinoceros, and (3) the red weevil (*Rhynchophorus ferrugineus*). These insect pests have been prevailing throughout most of the Batticaloa District to an alarming extent for many years. The plantations in Batticaloa South are seriously affected by the caterpillar pest. The black beetle and the red weevil are also rampant all throughout the district. The Government Entomologist visited the district in April, and his report has been submitted to the Plant Pest Board through the Director of Agriculture. I have frequently visited the affected area. Most of the estate and coconut compounds are found to be kept in a very insanitary condition, which accounts for the rapid spread of the red weevil and black beetle. The question of appointing Sub-Inspectors to combat the pest and carry out a campaign is now being considered by the Plant Pest Board. The coconut caterpillar pest appears to be less virulent after the rains of the past few months. Lamp traps were tried with a certain amount of success in many estates affected by the pest. Coconut stumps, too, were cut and burnt in some estates, while in some villages and estates they were buried. A special Sub-Inspector was sent to the district by the Agricultural Department to attend to work in connection with the coconut pest.

Co-operative Credit Societies.—Seven Co-operative Credit Societies are existing in the district in connection with the Paddy Bank. The members obtain their loan from the bank through their society. A Co-operative Credit Society for the Government servants of Batticaloa has been formed, having for its object the supply of provisions and other necessaries to the members, and to encourage thrift, self-help, and so on. The society will be registered early in 1922. This is a new departure on the line of co-operation in the district.

School Gardens.—Work in most of these gardens has been satisfactory. Many home gardens have been opened by the boys attending these schools in their villages. The cultivation of dhall has been undertaken in all school gardens very successfully, and its cultivation is on the increase. Curry stuffs were also tried, but were not successful. Onions are growing very successfully, and many villagers are cultivating them on an extensive scale. The school gardens in the district are as follows :—

Government Schools : Eraur, Oddamaneddi, Kadankuddy, Sainthamarathu, Nindoor, Oluvil, Addalachenai, Sammanthurai, and Irakamam. Mission Schools : Arasadi, Kalladi, Pandiruppu, Kalmunai, Akkaraipattu, Pothuvil, Kaluthanellai, Morakotancherai.

Lectures.—Lectures were delivered by me to the cultivators and podys in various parts of the district on agricultural matters. The necessity of increased food production, the advantages of artificial and green manuring, seed selection, vegetable culture, Co-operative Credit Societies and their advantages were amongst the subjects dealt with.

Chenas.—Chena cultivation in the district has decreased this year owing to limited area being given out. There has been a corresponding increase in paddy cultivation in the interior villages ; several of these villages were visited by me, and instructions as to the proper methods of cultivation, &c., were given.

Cotton, sugar-cane, and castor plants are thriving very successfully in the district.

With the awakening in Ceylon of introduction of weaving on extensive scale, and the advent of weaving schools introduced in various places by the Education Department, the importation of yarns for the purpose could, in course of time, be dispensed with, and yarns be manufactured locally ; if only the potentiality and possibility of growing cotton in a district like Batticaloa can be made to be realized by the landed proprietors. There are at present three varieties of cotton growing successfully in the district. The output is not sufficiently large to be of any commercial value at present.

Paddy.—This being one of the largest rice-producing districts in the island, most of my time, attention, and energy are devoted in the cause of furthering paddy cultivation by imparting instructions on improved methods of cultivation, such as green manuring, weeding, &c., and conducting paddy manuring experiments. The advantages of green manuring have been brought home to many a cultivator, who now resort to it on a small scale. The quantity of seed sown per acre is higher than what it ought to be, so much as 3¾ bushels being sown per acre, where 2 to 2½ bushels would be ample to produce better results.

Paddy manuring experiments by the application of (artificial) manures are being conducted in different paddy cultivating centres, which are easily accessible to the people. They are as follows :—

No.	Name of Place.	Area. Acre.	Name of Manure.	Name of Paddy.	Age of Paddy. Months.
1	Buffalo Island	½	Fish guano .. 42 lb. Ephos phosphate .. 50 lb. Nitrolim .. 20 lb.	Perung Carruppen	4
2	Kokuvil	½	Ephosphos and green manures .. ½ cwt.	Vellaimurungakai	4
3	Kumbalamadu	1	Bone meal and green manures .. 112 lb.	do.	4
4	Illupuddichenai	½	Bone meal .. ½ cwt.	Vellai Nel	4
5	Pankudavelli	¾	Green manures .. 1 cwt.	Murungakai	4
6	Pullumalai	1	Do. .. 1 cwt.	do.	4
7	Do.	1	Groundnut cake .. 80 lb. Steamed bone meal .. 100 lb. Sterilized animal meal .. 44 lb. 224	do.	4
8	Palayadithonai	½	Half the above quantity	Carruppen	4
9	Palakadu	½	Groundnut cake .. 80 lb. Steamed bone meal .. 100 lb. Sterilized animal meal .. 44 lb. 224	Kitnan	4
10	Palakadu	1	Steamed bone meal .. 56 lb. Sterilized animal meal .. 28 lb. 84	do.	4
11	Pullumalai	½	½ cwt. ephos phosphate applied last year : a further addition of green manures this year	Murungakai	4

Experiments in transplanting paddy are being conducted at (1) Kumbalamadu, (2) Pullumalai, and (3) Palayadithonai.

In a plot at Palayadithonai only green manures are tried. The following are the results of the manuring experiments conducted during 1920–21 :—

Name of Manure.	Area. Acre.	Results. Matupalai. Bushels.	Pullumalai. Bushels.	Singalpaddai. Bushels.
Ephos phosphate and green manures 56 lb.	½	11	15	11
Steamed bone meal 56 lb. Sterilized animal meal 28 lb. 84	½	8¼	12½	8¼
Fish guano, ephos phosphate, nitrolim	½	7½	8	7½
Control	½	7¼	9	10

The ploughs used in the district are of a primitive type. Demonstrations with goiya and Meston ploughs were given at different paddy-growing centres in the presence of many cultivators and podys. They realize their advantages, but are slow to change their methods. So far I have had one order for a goiya plough.

The cattle in the district are small and weak, so much so that they find the working of a goiya or a Meston plough too much for their strength, and with the ever-increasing area brought under paddy cultivation, the problem of finding sufficiently strong cattle to cope with the requirements stares the peasantry in the face and calls for early consideration.

VIII.—THE WORKING OF CO-OPERATIVE SOCIETIES.

THE economic condition of the village population in the year under report appears to be better in certain respects, but the scarcity of ready cash in the villages in the Western, Southern, and the Sabaragamuwa Provinces, owing to the slump in the rubber and the plumbago industries, was a restriction on the progress of the co-operative movement. The manure market was easier, but it was in no way normal. The repayment of loans was not satisfactory, but in other respects the progress of the societies was fairly satisfactory. The passing of the new Co-operative Societies Ordinance, which took place about the end of the year, is an important event in the history of the co-operative movement in the Island. This new Ordinance makes ample provision for the advancement and expansion of the movement.

Mr. P. B. Herat, whose untimely death on December 28 has to be recorded with regret, was appointed Assistant Registrar for the whole Island, and Messrs. F. Burnett, G. Harbord, and N. Marshall were appointed Assistant Registrars for the Southern, Central, and Northern Divisions, with effect from December 1, 1921. Messrs. M. Amarasinha and S. B. Yatawara were away in Madras for six months for training in co-operation under the Registrar of Co-operative Societies, Madras. On their return they were attached to the office until December. Mr. A. M. Muttukumaru, Tamil Inspector of Co-operative Societies, was transferred to the Northern Division to work under the Assistant Registrar, and Messrs. Amarasinha and Yatawara, Sinhalese Inspectors, were transferred to the Southern and the Central Divisions for similar work.

Societies.—Thirteen new societies were registered within the year. These are Udupila, Balangoda, Department of Agriculture, Matara-Wellaboda pattu, Kengalla, Kudattanai, Udugoda-Pallesiya pattuwa, Kahawatta, Buddhist English Schools, Kandy Rickshawmen's, Chavakachcheri, Kiriwattuduwa, and Illuppitiya-Unawatuna Society.

The registration of one society, viz., Uduwawala Co-operative Credit Society, was cancelled.

The number of societies at the end of the year stands at 165, showing an increase of 12 societies for the year.

Members.—The number of members at the end of the year was 19,450. This is an increase of 2,346 over last year. The average number of members in a society is 117.

Capital.—The paid-up capital rose from Rs. 118,243·50 in last year to Rs. 125,721. The increase is Rs. 7,477·50.

Deposits.—The deposits have slightly increased. Certain societies show gradual increase in the amount deposited by members from their savings. The total amount to the credit of members under this head is Rs. 18,316.

Loans.—There was considerable increase in loan transactions. The amount lent during the year was Rs. 131,013, and the amount repaid amounted to Rs. 97,585 : Rs. 116,932 was outstanding at the end of the year.

Reserve Fund.—At the end of the last financial year, viz., March 31, 1921, a sum of Rs. 20,522·97 was due to reserve fund. Of this, Rs. 5,820 had been deposited in the banks.

PROGRESS OF THE MOVEMENT IN THE PROVINCES.

Western Province.—The number of societies increased by three, and there are 50 societies in the Province. Two of the new societies are ordinary agricultural societies, and the Buddhist English Schools Society is an urban society formed for the past and present teachers of Buddhist English Schools with head quarters at Ananda College. The progress of the majority of the societies in the Colombo District was satisfactory, but the same thing cannot be said of a large number of societies in the Kalutara District. The slump in the rubber market affected the working of a large number of societies in the Kalutara District. The Government Printing Office Co-operative Society started a Provident Fund, and is making very satisfactory progress. The proposal to start a Central Bank at Minuwangoda had to be put off for next year until the Ordinance No. 7 of 1911 was amended.

Central Province.—The total number of societies in this Province is 20. This is an increase of three societies over last year. Four new societies were registered, and the registration of one was cancelled. There are 14 societies in the Kandy District, 4 in the Matale District, and 2 in the Nuwara Eliya District. The Department of Agriculture Co-operative Society is one formed among the staff of the Department, and has commenced to transact business. It is a credit as well as a supply society. The Rickshawmen's Society proposes to assist the rickshawmen in the purchase of rickshaws on hire-purchase system, so as to enable themselves to possess, in due course, rickshaws of their own. The new societies are making progress, but the conditions of the old societies are yet unsatisfactory.

Southern Province.—Two new societies were registered in the Province, one from Galle and the other from the Matara District. The number of societies now stands at 32. There are 15 societies in the Galle District, 14 in the Matara, and 3 in the Hambantota Districts. The Hambantota Government Servants' Society has started giving loans of money in addition to the supplying of provisions, and the new society in the Galle District is one started for the express purpose of encouraging home industries. The progress of societies is fairly good.

Northern Province.—The number of societies was increased by two, both of which were started in the Jaffna District, bringing the total number of societies in the Province to 19, of which 17 are in the Jaffna District and 1 each in the Mannar and the Mullaittivu-Vavuniya Districts. Application for the registration of a new society organized at the end of the year in the Mannar District is under consideration. The progress of the work of the large number of societies is satisfactory.

North-Western Province.—The number of societies remains the same, viz., 4 : two in the Chilaw District, 1 each in the Kurunegala and the Puttalam Districts. The 2 societies in the Chilaw District have shown some activity. Certain interest is now shown in the matter of Co-operative Societies in the Kurunegala District after the arrival of the new Government Agent, who took an active part in the movement in the North-Central Province.

Eastern Province.—There was no increase in the number of societies in the Province within the year under review, and the number of societies remains at 14. Ten are in the Batticaloa District and 4 in the Trincomalee District. The working societies in the Batticaloa District have received considerable financial assistance from the Batticaloa Paddy Bank. The Trincomalee District Society is a progressive society, and is doing good business.

North-Central Province.—No new societies were started in the Province within the year, and of the 8 existing societies 4 are doing very useful work.

Province of Uva.—This Province has 7 societies. The 3 societies in Wellassa are continuing to carry on work satisfactorily. Uva Society has again failed to work on co-operative principles, and the response from members was discouraging. Wellawaya Society had done no work during the year.

Province of Sabaragamuwa.—The Ratnapura District had 2 new societies registered during the year, and the total number of societies in the Province is 11. Ratnapura District has 5 and the Kegalla District 6. The Godakawela and the Kahawatta in the Ratnapura District and the Three Korales Society in the Kegalla District are making satisfactory progress.

Inspection of Societies.

The Registrar inspected a number of societies in the Northern Province, and the Tamil Inspector inspected the rest of the societies in the Northern and Eastern Provinces. The Secretary of the Board of Control carried out the inspection of societies in other Provinces. The two Sinhalese Inspectors have visited and inspected a number of societies.

Fininicial Assistance by Government.

Nine societies received financial assistance from Government during the year, and a sum of Rs. 9,340 has been received by them. The total amount outstanding on account of Government loans is Rs. 24,248·32. The Walapane and Handapangoda Societies paid and settled the loans given to them during the year.

Food Production.

As in the previous year a good deal of attention was given to the increase of food production in the rural areas by the societies. The Colombuturai-Poonakari Society in the Northern Province and the Kevitiyagala Society in the Western Province have worked their Paddy Banks for this end successfully. The Batticaloa and Anuradhapura Societies have solely devoted their attention to food production. The Uruwela Peruwa Society took a keen interest in the management of paddy cultivation regularly within its area of operation, and the society took a keen interest in the election of vel-vidanes in the locality. The Matara-Gangaboda Pattu Society is interesting itself in the improved cultivation of paddy by transplanting and manuring, and the prizes offered at the last Show held at Tihagoda for transplanting paddy were awarded to members of the society.

In this connection Dr. C. Brito Babapulle of Colombo offered to the Food Production Department a gold medal of the value of Rs. 100 to be awarded to a cultivator who obtains the largest increased yield in paddy from an extent of at least one acre by the use of manure and other improved methods, and the prize was awarded to a member of the Weligam Korale Co-operative Credit Society, who obtained a record yield of 84⅞ bushels from an acre field. Several societies have made arrangements to start paddy competitions.

Supply of Manures.

The supply of bone manure continued during the year. The price of this commodity was slightly better than last year, but is still very much higher than the pre-war prices. The following are the particulars of the supply of bone manure supplied during the year under review :—

	Quantity. Tons.	cwt.	qr.	lb.	Cost. Rs.	c.
1921	244	16	0	0	29,561	31
1920	241	17	3	18	35,061	37

At the end of the year the price of bone manure was quoted at Rs. 120 per ton.

The Supply of Implements.

The supply of agricultural implements through Co-operative Societies is becoming popular, and the number of societies dealt with the supply of implements during the year has increased. Messrs. H. Don Carolis & Sons and Hunter & Co. have agreed to supply implements on six months' credit. Messrs. Brown & Co. supplied a certain brand of mamoties.

Supply of Provisions.

The supply of provisions and stores through Co-operative Societies is receiving attention, and so far two urban societies, viz., Hambantota Government Servants' Society and the Department of Agriculture Society, are supplying provisions and other stores to their members.

Home Industries.

The establishment of a society in the Galle District for the purpose of assisting home industries is a movement which will be welcomed by many. This society proposes to assist the members in the following industries, viz., lace-making, coir industry, and carpentry. The Industrial Society in Jaffna is assisting the gold and silver workers in a small way.

SOCIAL WORK.

The Kandy Rickshawmen's Society is an attempt in this direction, and has launched a scheme to attend to the need of rickshawmen in the town of Kandy.

DISPUTES.

The Registrar presided at a meeting of a society to settle certain disputes among the members with regard to the election of office-bearers at a meeting.

The first defalcation in the working of Co-operative Societies occurred within the year. Although the society will not suffer any financial loss, the occurrence of the defalcation is a matter for regret, and is a warning that necessary precautions against such possible occurrences in the future must be taken.

CO-OPERATIVE EDUCATION.

A series of training classes for the training of secretaries, treasurers, and other honorary workers of Co-operative Societies were held during the year at the following centres, viz., Kalutara, Horana, Matara, Galle, Colombo, Henaratgoda, Anuradhapura, Kandy, Badulla, and Jaffna. 118 societies sent up representatives, and 268 office-bearers and 137 others attended the classes. 405 members and visitors in all attended the classes. The Government Agents and Assistant Government Agents in the Provinces and districts, respectively, where the classes were held, presided at the opening of the classes, and rendered considerable support. The instructions given at the classes were appreciated by the members.

The students at the School of Tropical Agriculture were given lectures on co-operation. An annual prize for co-operation was inaugurated this year.

The vernacular magazines of the Department " Govikam Sangarawa " and the " Kamatolil Velakam " have been supplied free to societies.

A leaflet on Co-operative Societies Ordinance, No. 34 of 1921, was issued to societies.

Co-operative Societies Ordinance.—Copies of the new Co-operative Societies Ordinance, No. 34 of 1921, have been issued to all societies.

N. WICKREMARATNE,

Peradeniya, January 31, 1922. Secretary, Board of Control, Co-operative Credit Societies.

IX.—REPORT OF THE WORK OF BOTANIC GARDENS.

ROYAL BOTANIC GARDENS, PERADENIYA.

IMPROVEMENTS AND ROUTINE.

IN addition to the routine of grass cutting, weeding, watering, road upkeep, and general upkeep, several improvements have been carried out.

The principal improvement has been in connection with the Coniferæ section on the hill in the South Garden. A new winding path has been made from the Lake road up the hillside, joining the path on the top by means of three flights of steps. Branching off at the foot of the latter to the right, the new path joins the old path behind the Director's quarters.

The river bank on the west side of the Gardens, opposite the Great lawn and Monument Hill, has been cleared of coarse growth, and the ground uniformly sloped, being re-turfed where required. Towards the foot of the bank and about 15 feet above the normal level of the river a gravelled path has been made.

The east end of the fence for ornamental climbers by the flower garden has been deviated so as to follow the drive to the end of the Palmyra avenue.

The small rockery which had long existed by the side of the lake has been abolished, the plants being transferred to the rockery bank above the river drive below Monument Hill.

Some thirty-eight of the taller palms in the palm group inside the entrance were cut down and removed. This striking oval group, first begun about 1839, having grown so tall as to mar the beauty of many of the palms and entirely block out the view of the Central drive and borders, it was decided in 1920 by the Committee appointed to consider improvements connected with the celebration of the Centenary of Peradeniya Gardens to abolish it in its present form, substituting an ornamental design set in a lawn, with a fountain in the centre.

CULTIVATION, PLANTING, &c.

In the arboretum the work of extending the collections in their natural orders has progressed, and the young trees already growing have received the necessary attention as regards shade, supports, mulching, &c. About 162 plants were planted out in their respective orders during the year.

The Coniferæ collection on the hill in the South Garden has been considerably extended ; it has also been increased in numbers by about 66 plants. It now covers the slope which was formerly under Urticaceæ and Lauraceæ, the representatives of the latter two orders having now been nearly all transferred to the arboretum.

An addition of twelve more palms has been made to the palmetum, which is now making good progress.

An important extension to the area under Guinea grass (*Panicum muticum*) for the Government draught bulls has been made on the river bank, near the bridge, in the South Garden, the ground being first cleared of Tithonia and other coarse weeds, then thoroughly dug and broken up.

The area planted with Guinea and other fodder grasses on the east river bank in 1919 has now become impoverished, and requires manuring or replanting.

Nurseries.

Work in the nurseries was energetically carried on, and stocks have been increased, notwithstanding prolonged periods of dry weather and the very defective pipe-water supply.

A beginning was made in August thoroughly to overhaul the ornamental nursery, discarding plants which had become too old or stunted, and replanting the beds with new stock. The work, however, was hampered by difficulties of water supply as referred to above.

A new nursery, mainly of tropical vegetable stocks, was formed to the east of the seed store, opposite the Agricultural School, for the purpose of supplying school gardens. This has been enclosed by a barbed wire fence and a hedge.

The collections of tropical vegetables, as Dioscorea, Manihot, Alocasia, &c., arranged behind the Palmyra avenue, have now been mostly transformed to the Peradeniya Experiment Station.

The propagation of Hevea by budding has been carried on with some success under the immediate supervision of the Curator, who gave a demonstration on the subject before the Kalutara Planters' Association in November.

Fruit and Seed Crops.

The year has been favourable for fruit and seed production. The Brazil nut tree (*Bertholletia excelsa*), which is now forty-two years old and about 60 feet in height, is increasing in fruitfulness. Some 50 fruits, each containing about 12 seeds, were produced during the year, and from these a stock of seedlings has been raised.

The durian trees have, with the exception of the oldest trees, produced a plentiful crop, but the fruits were unusually small, probably as a result of a dry year. This fruit is now fairly plentiful in Ceylon when in season.

The mangosteen has fruited freely this year, but, as with durians, the fruits were generally small. The slow growth of the tree, which takes eight or nine years to come into bearing, is unfortunately against its being freely planted.

Hevea (Para rubber) produced a heavy crop of seed, for which there has been little demand. Some 63,000 seeds were supplied to applicants. No. 2 tree produced 7,180 seeds.

Notes of Botanical Interest.

The seven talipot palms (*Corypha umbraculifera*), which flowered in the talipot avenue in 1918, fruited in 1919–20 and then died, were cut down and removed this year. The avenue was planted in 1880, so that these palms flowered when thirty-eight years old and died at 40. The tallest was 80 feet, exclusive of the inflorescence, which was 25 feet in height. The largest of the cylindrical stems was 11½ feet in girth at 3 feet from the ground. The rest of the avenue do not yet show any signs of flowering.

The following species flowered for the first time at Peradeniya : *Veitchia Joannis*, a palm introduced from Fiji in 1914 ; *Caryota plumosa* received from Rio de Janeiro in 1910 ; *Bauhinia Krugii* received from Porto Rico in 1906 ; *Lecythis Pohlii* and *Quercus discocarpa*, both received in 1904 ; *Justicia calycotricha*, *Sinningia carolinæ*, and *Tillandsia Duvallii*. The last three were introduced in 1921.

Podocarpus cupressina, a beautiful coniferous tree of Java, &c., produced a few fruits during the year, and from these four seedlings have been raised—the first from locally-produced seed.

The beautiful Barberton Daisy (*Gerbera Jamesonii*) of South Africa has now become established here, notwithstanding the great difference between this climate and that of the plant's native habitat. A bed of this has been planted in the flower garden.

Plant Introductions.

Five cases of plants were imported by the Superintendent on his return from leave in July. These comprised a collection of rockery plants for the new rockery in Hakgala Garden and a number of interesting additions to the general collections, including free contributions from the Royal Botanic Gardens, Kew ; Botanic Gardens, Brussels ; the Colonial Botanic Gardens, Læken ; Messrs. Sander & Co's. nurseries at Bruges and St. Albans.

The following are the principal introductions for the year :—

Asparagus madagascariensis ..	Kew	*Palisota Schweinfurthii* ..	Brussels
Cassia renigera ..	Bombay	*Palisota Albertii* ..	Kew
Colvillea racemosa ..	do.	*Pholidocarpus macrocarpa* ..	Singapore
Dasylirion acrotrichum ..	Brussels	*Podocarpus chinensis* ..	Bombay
Dorstenia convexa ..	do.	*Podocarpus littoralis* ..	Læken
Duvernoya deweriana ..	Læken	*Roscheria melanchætes* ..	Seychelles
Episcia tessellata ..	Kew	*Sinningia Carolinæ* ..	Kew
Hippomane mancinella ..	Bombay	*Sinningia Helleri* ..	do.
Hymenandra Wallichii ..	Kew	*Sansevieria Laurentii* ..	Brussels
Hibiscus Cooperii ..	do.	*Sarcocephalus Gillettii* ..	Læken
Ilex paraguayensis ..	Bombay	*Taraktogenos Kurzii* ..	Burma
Myrrhenium atropurpureum ..	Kew	*Tillandsia Duvalii* ..	Brussels
Palisota Elizabethæ ..	Brussels	*Yucca pendula* ..	Malta

A collection of ten dozen roses was received by purchase from Australia in September, and planted out at once in the north end of the flower garden, where most of the plants have become well established.

Six plants of *Agathis robusta*, raised from local seed, were presented to the gardens by Mr. F. H. Fraser, Pittakande, Matale, and thirty plants of *Gerbera Jamesonii* by Mr. E. M. Le Feuvre, Rattota.

ECONOMIC MUSEUM.

The condition of the contents of the Museum has been well maintained. Labelling requires constant attention and frequent renewal. The collections are being added to as opportunity occurs.

MISCELLANEOUS.

Improvements to the grounds of the Law Courts, Colombo, were carried out under the advice and supervision of the Gardens officers.

The Superintendent gave assistance and judged at Agri-Industrial Shows held at Henaratgoda and Galle.

The Curator continued to give practical demonstrations in horticulture to the students of the Peradeniya Agricultural School.

VISITORS.

The number of visitors, mostly from abroad, who signed the Visitors' Book kept at the Entrance Lodge is 3,172. These included the Crown Prince of Japan and party in March, a Belgium Royal party consisting of T. S. H. Princes (2) and Princesses (3) de Croy in December ; Dr. Kanehira, Director of Forests and Botanic Gardens, Formosa, in October ; and Prof. E. H. Wilson, Assistant Director of the Arnold Arboretum, Harward University.

METEOROLOGICAL.

The year has been unusually dry, and the Gardens suffered much in consequence. The total rainfall was 66·66 inches, against the average of 88·94 inches. February was the driest month (with nil return), and August the wettest, with 11·90 inches. The heaviest rainfall in any 24 hours was 2·46 inches on August 27–28. The following is the rainfall for the year, showing the average per month for the last 38 years :—

Month.	Rainfall for 1921.		Average from 1884 to 1921 inclusive.	
	Inches.	Days.	Inches.	Days.
January	9·26	19	3·74	6
February	—	—	1·55	3
March	3·27	5	4·68	7
April	6·14	22	8·45	12
May	1·28	7	5·91	11
June	4·63	17	11·03	17
July	7·69	19	8·31	18
August	11·90	24	6·04	13
September	2·19	7	6·72	15
October	10·50	17	13·54	18
November	3·74	8	10·41	16
December	6·06	8	8·56	12
Total	66·66	153	88·94	148

HENARATGODA GARDEN.

The general condition of the Garden has continued to improve during the year, notwithstanding the defective water supply. Two paths have been opened up through the jungle, one on either side of the palm avenue from the entrance. The boundary fence has been repaired, the wires being tightened, and the posts renewed where required. The nursery stock has been increased in quantity and variety.

The rubber trees affected by root disease, having been treated as recommended by the Botanist and Mycologist, appear to have now completely recovered.

Special preparations have been made on the river bank at the west end of the Garden for planting selected varieties of coconuts, the ground being raised above the ordinary flood level, and large deep holes made.

The Ipecacuanha plots in a shady part of the jungle are thriving. It has been found that the best way of propagating the plant is by means of the annular rhizomes, which may be broken up into small sections and spread over a bed of fine humous soil, covering them well with the latter.

A small plot of the Sisal hemp plant has been established here, and is so far thriving.

The pineapple plots consisting of three varieties have made satisfactory progress. It is difficult to prevent the fruits as soon as they approach maturity from being picked by crows.

The Double Coconut (*Lodoicea sechellarum*), which has been in fruit since 1912, has set four more fruits, being pollinated by pollen sent from the male tree in Peradeniya Gardens. The total number of fruits now on the tree is 20, the oldest of which are ten years, and now nearly ripe. The heavier have to be supported by props, and the tree does not seem capable of carrying a larger crop.

A fine specimen of a talipot palm (*Corypha umbraculifera*) commenced to flower in July, and fruit began to set by the end of the year.

The coconut house, presented to the Garden in 1920 by Mr. W. M. Rajapakse, has had a cement floor put in.

The Assistant Curator, Mr. Gunaratne, has continued to give practical demonstrations to the pupils of the Vernacular Teachers' School in the Garden.

The rainfall for the year is as follows :—

Month.	Inches.	Month.	Inches.
January	5·50	September	2·54
February	—	October	14·57
March	2·90	November	4·93
April	11·32	December	3·90
May	10·58		
June	2·95	Total	73·46
July	7·94		
August	6·43		

HAKGALA GARDENS.

The following is from the report of the Curator, Mr. J. J. Nock :—

"Rosary.

"Early in September the five centre borders in the Rosary were dug to a depth of three feet and provided with suitable drainage. Manure and clay were added to and well mixed with the soil, and the borders prepared for the reception of the new rose plants received from Messrs. E. & W. Hackett, Limited, Adelaide.

"The roses were planted on September 13, and several were in flower six weeks later. The plants are doing well, although many of the buds damped off during the wet weather experienced in November and December.

"Most of the old plants from these borders have been transferred to the four outer borders, which have been overhauled and manured.

"Labels from all the plants in the rosary have been written, and will be put out as soon as possible.

"New Rockery.

"The opening up of a rockery and water garden between the fernery and camphor plantation, which was commenced during April, has been continued, and it is hoped that most of the work will be completed before the 1922 season.

"The main path through the rockery, which branches off from the path leading from the fernery to camphor plantation, is approximately 75 yards long. Smaller paved paths have been made in the various portions of the rockery, so that all parts can be conveniently inspected.

"Three ponds have been made, and the following lilies planted out in the same :—*Nymphæa stellata*, mauve and pale mauve varieties, *Nuphar lutea*, and *Aponogeton monostachyon*. Three small islands in the pond near entrance have been planted up with *Typha augustifolia* (Bullrush), *Cyperus Papyrus* (Egyptian Papyrus), and *Osbeckia rubicunda*.

"The following are among the more interesting plants put out in the various sections :—*Primula malacoides, P. obconica, P. vulgaris, Saxifraga sarmentosa, Prunella grandiflora, Myosotis sylvatica, Verbena bonariensis, Sprekelia formosissima, Linaria cymbalaria, Rehmania angulata, Sempervivum arachnoideum, S. montanum, S. cornutum, Eridiron alpinum, Campanula carpatica alba, C. multiflora, C. rapunculoides, Sedum rupestris, S. spathulæfolium*, and varieties of Iris, Cyrtanthus, Zephyranthes, &c.

"Practically all the rocks used in the extension towards the camphor plantation were obtained near the Eucalyptus plot, and, being lichen covered, are in keeping with the rocks in the outer portions of the rockery.

"A number of Cupressus and Pinus trees have been cut out during the course of opening up the rockery.

"Several underground drains have been put in to drain the upper portion of the swamp, which has been levelled and planted with grass.

"Fernery.

"During January the borders round the fernery pond were thoroughly overhauled. Practically all the plants were removed from these borders, which were given a good dressing of leaf mould, deeply dug and replanted.

"The paths in this section have been widened and improved, and the Selaginella edgings renewed. The path from this section to the Meteorological shed has also been widened and improved.

"The bridges have been kept in order, and the steps in the various sections repaired.

"All the *Musa ensete* plants planted out in December, 1920, are growing very well.

"The section between the main path and path to camphor plantation has also been attended to, the borders being replanted and paths remade.

"New Flower Garden.

"The two long borders have been thoroughly overhauled. The majority of the perennials have been rearranged, and the front of the borders planted up with annuals.

"The beds on the lawn have been rearranged, and two more have been added. These have been planted up with different varieties of Salvia.

"Lower Rockery.

"This received a good deal of attention during January and February. Owing to the heavy rain following the first planting, many of the more tender plants damped off. All vacancies were filled, and all clumps of plants labelled.

"Stepping stones have been placed through the larger sections, the various portions of which can now be easily inspected.

"A Cupressus hedge has been planted round the lower section, and is coming on well.

"Oxalis has been very troublesome throughout the year, and a good deal of labour has been used to keep this in check.

"Nursery.

"A good stock of plants has been kept up during the year.

"During November-December all the beds were filled with cuttings of shrubs, and a large number of plants put into baskets.

"1,300 roots of *Paspalum dilatatum* have been supplied to the Manager, Experiment Station, Peradeniya.

"A good batch of *Eucalyptus globulus* has been raised from seed collected in Nuwara Eliya.

"One pound seed of *Pinus longifolia*, received from the Forest Botanist, Dehra Dun, has germinated well, and a good batch of seedlings have been put into baskets.

"1,000 bulbils of *Agave rigida* var. *Sisalana*, collected from a plant in the succulent collection, have been sent to Peradeniya.

"The lower path has been attended to, and all steps repaired.

"PLANTATIONS.

"The Pinus, Eucalyptus, and camphor plantations have been tidied up, and all undergrowth cut out.

"Loranthus has been removed from the trees in the camphor plantation.

"Plants of the following Eucalyptus have been planted out in the collection :—*E. globulus*, *E. pillularis*, and *E. robusta*.

"SHRUBBERIES.

"These have been kept in good order during the year.

"All the shrubberies within the drive have been pruned and attended to.

"Azaleas, *Streptosolen Jamesonii*, and *Brunfelsia bicolar* have flowered exceptionally well during the year.

"The shrubbery below the Acacia collection has been overhauled and replanted where necessary.

"THE PONDS.

"The upper pond was emptied during June, cleaned out, and the Nymphæas thinned. The clumps of plants round the edge have been mulched, and the retaining walls of the beds repaired.

"The leaks in the retaining wall near outlet have been cemented over.

"The pond has been stocked with trout received from the Ceylon Fishing Club.

"The lower pond was cleaned out during November, and the banks tidied up. The silt at the upper end has been removed.

"The bank on the left of outlet has been planted up with shrubs.

"IMPROVEMENTS.

"The banks of the stream opposite Rosary have been cleared of all undergrowth, suitably sloped and planted up with Paspalum.

"The lower sides of the banks have been built up with stone, and the drain put in good order.

"The bank on right of path leading from lower drive to lower rockery has been sloped, and the drain along path remade.

"The triangular shrubbery opposite the visitor's garage has been overhauled, and the corners rounded off.

"FRUIT PLOTS.

"The old fruit plot was taken in hand early in the year, and the fence put in good order. Several of the old trees have been cut out, and the remainder trimmed. The following plants received from Messrs. G. Brunning & Sons, Victoria, have been planted out :—

"Apples : Dumelow's Seedling 1, Cleopatra 1, Jonothan 1.
"Cherries : Bigarreau Common 2, Early Rivers 2, Waterloo 2.
"Pears : Beurre de Capiaumont 2, Marie Louise 2, Beurre de Diel 2.
"Plants of Loquat, Calcutta Guava, Fig, Cherimoyer, &c., have also been planted.

"The following have been planted in the new plot :—

"Apples : Cleopatra 1, Jonothan 1, Dumelow's Seedling 1.
"Peaches : Dymond 2, Early Rivers 2, Royal George 2.
"Plums : Cherry Plum 2, Crittenden's Damson 2, Red Heart 2.

"CHENOPODIUM.

"The terraced plot below the Foreman's quarters was planted up with *Chenopodium ambrosioides* on January 4. Apart from damage done by cattle and cut-worm, the plants did well. Forty pounds of seed collected during June-July has been sent to the Director of Agriculture.

"*Java Variety*.—An acre plot on the patana above the camphor plantation has been opened up and was planted on July 29, but the plants have proved a failure. Plants of the same variety put out in the terraced plot below the Foreman's quarters on July 30 are doing fairly well, but the growth is not nearly so vigorous as that of the local *Chenopodium ambrosioides*.

"The Managers of the Peradeniya and Anuradhapura Experiment Stations have each been supplied with 2,000 seedlings of the Java variety.

"ACACIA ELATA.

"Seeds of this acacia have been collected from the only specimen in the Gardens—on the side of the path leading to Hakgala Peak. The flowers of this species are similar in colour to those of *A. decurrens*, but are much larger. It is one of the most beautiful of arborcous acacias, and is similar in foliage and habit to the pepper tree (*Schinus molle*). This is the first time seed has been collected, although the tree has flowered frequently.

"Cinnamomum Camphora.

"Three trees were in flower during October, but no fruit has set.

"Dr. Kanehira, Director of the Experiment Station and Botanic Garden, Formosa, who visited the Gardens in October, has kindly promised to send seed of camphor for further trial at Hakgala.

"Introductions.

"Plants and seeds have been received from the following:—The Director, Montevideo Botanic Garden; the Manager, Government Cinchona Plantations, Bengal; Mrs. L. M. W. Wilkins, Neboda; Miss Tilly, Talawakele; Mrs. A. C. Wilson, Halgran-oya; the Yokohama Nursery Co., Japan; the Manager, Experiment Station of Forestry, Formosa; Mr. John Cotton, Ambawela; the Director, Sydney Botanic Gardens; Mr. E. C. Villiers, Balangoda; Messrs. G. Brunning & Sons, Melbourne; Mr. W. Nock, Worcestershire; Mr. Clement L. Wragge, Waiata Botanic Garden, Birkenhead, N.Z.; Mr. John Horsfall, Bandarawela.

"Revenue.

"The amount realized by sales of plants and seeds for the twelve months ended December 31 was Rs. 1,019·61, and for the twelve months ended September 30, Rs. 794·91.

"The value of plants and seeds issued gratis or in exchange to Government institutions, &c., was Rs. 409·55.

"Weather.

"The number of inches of rain recorded during the year was 84·05, falling on 195 days, compared to 86·75 on 226 days during 1920.

"The wettest month was January, with a rainfall of 15·37 inches, and the driest month was February, with 0·11 inch.

"The highest temperature in the sun's rays was 171·2 on November 12, compared to 157·3 on March 1 of the previous year.

"The lowest temperature on the grass was 35·1 on February 25, compared to 36·2 on February 23 of the previous year."

NUWARA ELIYA GARDEN.

The Curator, Mr. J. J. Nock, reports :—

"General.

"The triangular grass plot near the log bridge was taken in hand early in the year, and has been levelled and returfed. The swampy portion has been filled in and brought up to the same level of the surrounding ground.

"During the latter part of February considerable damage was done to the shrubs, &c., by heavy frost. Abutilons, Tritonia, Agapanthus, Azaleas, &c., which were not usually damaged by frost, were affected. All the plants so damaged were attended to and trimmed.

"Stumps in all parts of the garden have been cut out.

"The banks of the flood outlet drain near log bridge have been planted up with Australian Daisy.

"The border between the central drive and nursery has received a good deal of attention, being thoroughly overhauled and replanted.

"The border near the gate leading on to the main road between Post Office and Scandal Corner has been levelled and turfed over.

"Arum lilies have been planted in the triangular depression near the log bridge.

"The removal of the coarse grass (*Sporebolus indicus*) from the lawns has been continued during the year.

"Three new beds have been made opposite the Eucalyptus clump and planted up with shrubs.

"The *Cupressus Lawsoniana* plants along the top of the flood outlet bank have been removed, and a row of *Cupressus macrocarpa* planted all along the bank to form a screen to hide the unsightly outlet drain.

"The sides of the drive near Post Office entrance and round fountain have been returfed, and the width of these drives made more uniform.

"Wistaria Chinensis.

"The plants received from the Yokohama Nursery Company have flowered well during the year.

"Rosary.

"The eleven dozen roses received from Messrs. E. & W. Hackett, Limited, Adelaide, were planted out on September 12. All the plants have done very well, and the Rosary has become one of the most attractive features of the park.

"New Pond.

"The new pond near the north entrance has been widened and reshaped, the soil dug out during these operations being used for filling depressions under the Eucalyptus above the pond.

"The outlet pipe has been raised to a few inches below the level of the drive.

"Revenue.

"The amount realized by the sale of plants and seeds for the twelve months ended December 31, was Rs. 12·50, and for the twelve months ended September 30, Rs. 25·75."

THE COLOMBO MUSEUM GARDEN AND COLOMBO NURSERY.

The grounds of the Colombo Museum have been well maintained, the fine lawn being as usual kept closely mown throughout the year. The pot plants were overhauled and mostly repotted.

The Colombo stock nursery has been temporarily accommodated in a secluded and shaded corner of the Temple Trees Garden, and arrangements are now in contemplation for a more permanent and suitable locality.

THE GOVERNOR'S AND COLONIAL SECRETARY'S GARDENS.

The King's Pavilion Garden, Kandy.

The usually attractive condition of this Garden has been well maintained. The flower garden has been overhauled and replanted. A number of superfluous and worn-out trees were cut down and removed, and young plants put out where desired.

The Lodge Garden, Kandy.

The borders and beds were manured and replanted, and the lawn and terraces have been kept in good order.

The Queen's House Garden, Colombo.

This has been maintained in good order. The borders were well manured, and the front rows replanted. The stock of pot plants has been considerably replenished.

The Temple Trees Garden, Colombo.

The condition of this Garden has been well maintained. A short avenue of Flamboyante trees (*Poinciana regia*) has been planted along the drive from the entrance gates, the unsightly old Casuarina trees being condemned to be cut down and removed as required for firewood. The plantain plot has continued to fruit well during the greater part of the year.

Queen's Cottage Garden, Nuwara Eliya.

The Hakgala Curator reports :—

"The flower garden has been considerably improved during the year. The long borders surrounding the lawn in front of the house have been given special attention, being widened, thoroughly overhauled, and replanted.

"The Spiræa hedge has been cut down to within a few inches of the ground in order to allow more room for the Cupressus hedge to develop.

"The annuals planted towards the end of the year promise to give a good show during the 1922 season.

"*Ipomœa Learii* has been planted to cover the lower part of the walls of the house, and is doing well. This will be substituted later by *Ficus repens*, which has been planted.

"The borders in the Staff Cottage Garden have been deeply dug, drained, and replanted.

'Several of the old *Acacia melanoxylon* trees have been cut out, and it is hoped to have others removed as soon as possible.

"Plants of the following have been put out in the arboretum :—*Casuarina montana* (She Oak), *Sequoia gigantea* (Californian Redwood), *Cupressus macrocarpa* (Monterey Cypress), *Cupressus Knightiana* (Knight's Cypress), *Eucalyptus globulus* (Blue Gum), *Eucalyptus pillularis* (Black Butt), *Eucalyptus robusta* (Swamp Mahogany), *Agonis flexuosa* (Willow Myrtle), *Hakea saligna* (Willow Hakea), and *Platanus acerifolius* (Plane).

"The old lower vegetable garden has been abandoned for the cultivation of vegetables, and has been planted up with annuals and perennials to provide cut flowers.

"A new extension of the vegetable garden has been opened up on the grass land above the upper garden, and it is hoped that results, at any rate with cruciferous vegetables, will be successful.

"Club-root and cut-worm continue to be troublesome, and owing to the former the cultivation of cauliflowers and cabbages is very difficult.

"The main paths through the vegetable gardens have been made more uniform in width and edged with Thyme."

Cuddeson Garden, Nuwara Eliya.

The Curator, Hakgala, reports :—

"Ninety roses received from Messrs. E. & W. Hackett, Limited, Adelaide, have been planted out on the Circular lawn in front of the house, and have flowered well.

"The row of Abutilons on left of porch have been removed, and a row of *Cupressus macrocarpa* planted to form a hedge.

"The Spiræa hedge along the side entrance drive has been dug out in order to encourage the growth of the Cupressus planted to form a hedge.

"The main path through vegetable garden has been attended to and edged with Thyme.

"The shrubs planted on the bank inside entrance gate have been removed, as they were not doing well under the shade of the Cupressus avenue.

"Both the flower and vegetable gardens have been kept in good order during the year."

H. F. MACMILLAN,
Peradeniya, February 8, 1922. Superintendent of Botanic Gardens.

REPORT OF THE CURATOR, ROYAL BOTANIC GARDENS, PERADENIYA, FOR 1921.

Nurseries.

Improvements in both economic and ornamental nurseries have been undertaken in view of the increasing demands made upon garden stocks of certain kinds. In the reconstruction of ornamental nursery definite areas are allotted to the kinds mostly in demand and arranged in the form of groups, *i.e.*, ornamental shrubs, flowering shrubs, climbers, bulbous and tuberous plants, annuals and biennuals, cannas, and palms. The paths throughout the nursery have also been re-gravelled.

Roads.

Repairing and re-gravelling of paths and roads throughout the gardens have received regular attention in the following directions:—All bad patches in River drive and all small paths through arboretum, South Garden Circular road, Lake drive, Liana drive, Main and River drives from flower garden to Palmyra avenue.

Pinetum.

A large amount of labour was necessitated in the development and enlargement of the old pinetum on South Garden Hill. A new path was opened up entering pinetum from Lake drive, and joining up with South Garden path above the lily pond. The circle on summit of hill was considerably enlarged, allowing for the introduction of a considerable number of new plants. Plants raised locally from garden trees, augmented by collections from Hakgala and from the Seminary, Kandy, were planted in July last to the number of 148, and are growing well. The new path from Lake drive mentioned above forms the line of demarcation between the pinetum on left and palmetum on right hand side.

Arboretum.

Additional labour is demanded annually in the arboretum, as the collections in the various natural orders increase. New plantings to date for the period under review total 166 in all (distributed over thirty-eight natural orders). Sixty-three of the latter are entry number plants, of which a percentage are new to the Gardens. A number of gootees of trees in South Garden were secured for the arboretum also, and twenty-two transfers made, chiefly in the replanting and distributing of the ficus in the ficus collection. The thorough overhaul of the entire arboretum in the opening up by removal of giant forest trees and others, foreign to the particular natural order, has become imperative. In this respect a commencement has been made in the large leguminous section in B by the removal of superfluous large trees, mostly sapu, and a number of clumps of pandanus, thus affording space and air to the young plants established in the section. The fellings were sold by auction in October last, and the proceeds Rs. 256·25 credited to revenue.

Palmetum.

The extension of the palmetum continues, though limited to new introductions only, 7 new palms have been added during the period under review. The total contents of palmetum now number 68 general, comprising 138 species, the majority of the species being planted in duplicate.

Pond.

The establishing of water plants in South Garden pond was handicapped by the abnormally dry conditions experienced throughout the year and by the unsatisfactory and insufficient Garden water system. Owing to continuous attacks on all water plants in the pond by Gourami, a section has now been wired off and planted up with Victoria regia, Nymphia, and Nelumbium (all fish in the wired area having been removed to the pond proper) and are to date making good progress. Wooden labels to the clumps of cyperus, &c., bordering the pond, and boards on iron rods to all water lilies have been made and put out.

River Bank.

The river bank from road bridge and extending to large bamboo below Gardner's Monument has been cleared of undergrowth, and the area planted up with fodder grass to augment the Garden stock. The section from bamboo to below laboratories has received special attention, in view of its being utilized during the coming visit of H. R. H. the Prince of Wales.

The bank here has been uniformly sloped and turfed to form a terrace, and a path made at base of terrace. All drains from River drives have been straightened, and the lower river bank proper below new path has been supported by poles.

New Improvements.

Flower Garden.—The straight line of pillars defining the boundary at lower end of flower garden have been removed and re-erected in conformity with the existing drive leading to the palmyra avenue. *Ficus repens* has been planted round all such re-erected pillars, and the drains cut in alignment and at the rear of pillars. Beds for planting up of young plants of climbers to form an espalier were prepared and the plants put out.

Spice Collection.—The old spice collection area has been improved by the formation of a better drainage system, reduction of the road leading from flower garden pond to carpenters' shed, and the straightening and planting up of borders on each side of the path running through old spice grove.

Repairs have also been made to the cemented step near glass house, and the drain running from store tank to flower garden pond has been straightened and re-cemented.

Bamboo Collection.—With the object of giving more room to the present crowded bamboo collection, a clearance of part of the pandanus area has been undertaken, and all small and medium-sized bamboos taken up and replanted in the recently-cleared area. This has resulted in a much-needed opening up of the bamboos, and should add to the attractiveness of this part of the Gardens, as the bamboos re-established themselves.

Curator's Bungalow Compound.—The re-shaping of the Curator's bungalow compound was undertaken, and a large portion taken into the new pinetum. A shorter and much better gradient road was made by enlarging the small path leading from bungalow to main drive and opening out to this drive between main gates and present Lake road. The remaining portions of the old carriage road within the compound have been dug up, and the area turfed over. By the straightening out of the boundary edges and a reduction of the compound on main Kandy roadside, a much wider area is allowed for the purpose of later opening up a small path to the public leading from main gate to pinetum direct.

GENERAL.

(*a*) The removal of the rockery near South Garden pond has been completed. All plants required were planted in the present rockery on right of River drive below Monument Hill. The large rocks were blasted and removed to river bank on opposite side of pond to be stored for further improvement to this area. The *Beaucarnia* (*Nolina*) *recurvata* plant, being the only plant of its kind represented here, was retained till such times as off shoots have been established.

(*b*) Thirty-eight palms of the older and taller types represented elsewhere in the Gardens were cut out from the Palm Circle near gate, in accordance with the proposal to gradually cut out or remove the whole of the palms growing there for utilizing this plot for other purposes later.

(*c*) The seven talipot palms, which flowered in the South Garden in 1918 and fruited in 1919 and early 1920, having now died, were cut out and removed during March and April. Fortunately, the flowering specimens were not successive plants of either now, but practically alternate, so that the avenue as such still continues, though the spacing is affected by the removals. The measurements of the largest specimen cut out was, height 105 feet (including the inflorescence of 25 feet), girth 11½ feet at 3 feet from ground height.

(*d*) Ten dozen roses received from Messrs. E. & W. Hackett, Limited, of Australia, were planted out in prepared beds in north end of flower garden, and are growing successfully; nine only of the 120 roses having failed to withstand the transportation from Australia.

(*e*) The area behind the fernery and joining up with north end of flower garden and occupied with temple trees has been cleared through, the temple trees cut out, the area levelled and turfed over. The remaking of the path from fernery to flower garden centre path is now in hand.

(*f*) Progress in the labelling of the Garden continues, some 1,750 bricks, 259 wooden, and 162 zinc labels have been put out in addition to many new signboards.

BUDDING.

Experiments in budding of Hevea were undertaken regularly each month from January, resulting in successes on the patch system of budding in the September buddings. A report on the budding experiments undertaken in economic nursery on Hevea to date was made early in November. On November 30 the Curator visited Tebuwana and addressed the Kalutara Planters' Association on the work carried out to date at Peradeniya. Information on the spot was also given to those visitors to the Gardens interested in the subject.

VISITORS.

The number of visitors, mostly from abroad, who signed the Visitors' Book during the year was 3,172.

METEOROLOGICAL.

The following is the rainfall for the year, showing the average per month for the last thirty-eight years. The highest fall in any 24 hours was 2·46 on August 27–28 :—

Month.	Rainfall for 1921.		Average from 1884 to 1921, inclusive.	
	Inches.	Days.	Inches.	Days.
January	9·26	19	3·74	6
February	—	—	1·55	3
March	3·27	5	4·68	7
April	6·14	22	8·45	12
May	1·28	7	5·91	11
June	4·63	17	11·03	17
July	7·69	19	8·31	18
August	11·90	24	6·04	13
September	2·19	7	6·72	15
October	10·50	17	13·54	18
November	3·74	8	10·41	16
December	6·06	8	8·56	12
Total	66·66	153	88·94	148

Peradeniya, January 19, 1922.

T. H. PARSONS,
Curator, Royal Botanic Gardens.

X.—PUBLICATION DEPÔT AND CENTRAL SEED STORE.

This division is the outcome of the co-ordination and amalgamation of agricultural interests The decision to have an independent body established in Colombo as an Agri-Horticultural Society has been deferred for financial considerations, and the members of the old society still communicate their wants to this office, which temporarily carries on some of the duties that would have devolved on the new Agri-Horticultural Society, pending permanent arrangements at end of the year 1922.

The chief functions of this store are the distribution of publications and seeds. Activities in both lines are extending satisfactorily.

Interest in food production, both by the large and small cultivators, is increasing, and the supplies include seeds, cuttings, tubers, yams, grains, paddies, fodder, &c. The store has become so popular that, instead of seeds being in demand only in the two monsoon seasons, applications are received daily from all parts of the Island due, no doubt, to variation in weather conditions in different parts, which are so diverse as to necessitate stocking a regular supply throughout the year. Every effort is being made to meet the demand, and supplies of regular assortments of seeds, &c., are being imported from Vilmorin Andrieaux (France); Carter & Co. (London); W. Atlee Burpee (Philadelphia); Sutton & Sons, Reading; Brunnings (Australia); varieties of curry stuffs, paddies, &c., from well-known sources in India, Japan, &c. Since the beginning of 1921, the distribution has been—

	Bushels.	Pounds.	Packets.	Number.
Paddy	494⅝	80	—	—
Maize (Indian corn)	6¾	57½	—	—
Maize (South African)	595½	61	—	—
Dhall	—	131	36	—
Cowpea	—	192½	—	—
Green gram	—	½	—	—
Cicer gram	—	½	—	—
Gingelly	—	1¾	—	—
Sorghum	¼	50½	—	—
Durrah	—	8	—	—
Millet	—	½	—	—
Kurakkan	40½	—	—	—
Coffee	½	5	—	—
Pepper	—	½	—	—
Papaw seed	—	8½	12	—
Ginger	—	23½	—	—
Turmeric	—	12	—	—
Yams	—	36½	—	300
Artichoke	—	66	—	—
Groundnut	—	66	—	—
Vegetable seeds	—	297¾	20,204	—
Flower seeds	—	—	1,178	—
Curry stuffs	—	—	32	—
Sweet potato cuttings	—	—	—	5,570
Manioc cuttings	—	—	—	500
Plantain suckers	—	—	—	150
Pinapple suckers	—	—	—	2,100
Grafted plants	—	—	—	519
Cotton seeds	—	1,951	—	—
Tephrosia purpurea	—	83	—	—
Cluster beans	—	72	—	—
Castor seeds	—	160	—	—
Total	1,138⅛	3,365½	21,462	9,139

The germination of all seed is treated before it is sent out, and only reliable seed is supplied.

Grafted fruit plants were imported from Australia, Bangalore, Calcutta, Salem, &c.

The "Tropical Agriculturist" has become the Journal of Agriculture for the Colony, and the other publications dealt with from this depôt include Bulletins, Circulars, Leaflets of the Department of Agriculture, and the Vernacular Agricultural Journals, viz., "Govikam Sangarawa" (Sinhalese) and "Kamat Tholil Velakkam" (Tamil). A very appreciable number of new subscribers has been registered, both for the "Tropical Agriculturist" and Bulletins since October, 1921, and it is anticipated there will be a very substantial addition of subscribers to these.

J. S. DE SILVA,

January 31, 1922. Manager, Publication Depôt, and Central Seed Store.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE DIRECTOR OF AGRICULTURE FOR 1922.

SECTION I.

AGRICULTURE IN CEYLON.

THE climatic conditions during 1922 were not favourable for agriculture. Very dry weather was experienced during the early part of the year ; and the south-west monsoon, although it arrived early, and was particularly severe in some districts, was, on the whole, patchy and unsatisfactory. In some districts it ended early and crops suffered. The north-east monsoon was a particularly mild one, and in those districts dependent upon this monsoon for their rainfall, crops suffered as the result of the excessively dry conditions. The third quarter of the year was particularly dry up-country, and the drought was severe during this period in Uva. The rainfall in the Puttalam-Chilaw District was very short. Coconut crops suffered as a result in the latter part of the year, and the crops for the year 1923 are estimated at 25 to 30 per cent. below normal in consequence of the shortfall of rain. The paddy cultivators in Chilaw District have suffered considerably during the past two years from shortage of water, and many found themselves at the end of the year without stocks of seed paddy for their fields. In the Central Province and the hill districts generally the maha crop of paddy was a small one, owing to short-aged varieties having to be substituted for the longer-aged varieties, and many fields during the yala season could not be cultivated. The drought in the North-Central Province was very severe during the middle of the year, and many paddy crops failed completely. The rains in this area at the end of the year were, however, satisfactory, and the maha crops for 1923 promise to be good. Tea crops were, on the whole, slightly better than during the previous year, but were below the average. The reduced crop was in part due to the unsatisfactory climatic conditions, but also in part the result of continued attention to finer plucking, which is now being insisted upon, so that quality may be maintained. Rubber crops were not seriously affected by weather conditions, although some districts suffered particularly severely from leaf-fall and pod disease during the south-west monsoon. Coconut crops were larger on the whole than during the previous year, particularly in the Kurunegala District. In drier districts crops were somewhat below normal, and will be much shorter still during 1923 in consequence of the severe drought that these districts experienced during the first nine months of 1922. The dry year was favourable as far as disease was concerned, and with the exception of outbreaks of coconut caterpillar, coconuts were not severely affected with pests. The cacao crop was above normal. The spring crop was a good one, but the autumn crop was below expectations by reason of the failure of the earlier portion of the north-east monsoon. Paddy crops, taking the Island as a whole, were below normal during the year. Some districts produced excellent crops, but in other areas some complete failures occurred. Hill paddy crops promise to be satisfactory, and chena crops in many districts are very good.

Tea.

2. This industry has had an extraordinarily prosperous year. Crops were in excess of those of 1921, and prices were exceptionally high throughout the year, particularly for fine quality teas. In the months of August and September record prices for Ceylon teas were obtained, and the demand for fine teas has been strong throughout the whole year. The Uva teas were of exceptionally fine quality, as also were teas from Maturata and Uda Pussellawa. In consequence of the north-east monsoon being late in Uva, the fine quality of Uva teas lasted from July to October, a period greatly in excess of normal. Manufacture continued to receive close and careful attention, and all factories are now endeavouring to produce teas of high quality. Several factories are being completely overhauled, improvements are being generally effected, and engineering firms who undertake tea factory work are full of orders for the coming year.

3. The increasing prosperity of the industry has enabled estates to return to their full manuring programmes, and there is undoubtedly a marked improvement in the general appearance of the bushes throughout the whole tea-growing area. Cultivation has also been resumed again on all estates where labour has been satisfactory. Labour was a source of considerable anxiety to tea estates during the first three months of the year, as the result of the greater freedom afforded to labourers by the provisions of the Labour Ordinance, No. 43 of 1921. After the middle of the year coolies, however, became much more settled, and those estates which have endeavoured to provide for their well-being had their full complement of labour. Recruiting from India also improved, and the situation of estates in regard to labour was at the close of the year considered to be satisfactory. Wages have been increased, and bonuses are paid for extra work.

4. As the result of better cultivation during the year, and with the resumption of full manuring programmes, the health of the tea bushes has improved. Shot-hole borer is decidedly on the decrease, and experimental data has shown that certain manurial applications bring about a definite reduction of this pest, while general manurial applications materially assist in the healing of galleries. Red Rust disease has, as was anticipated in last year's report, become very materially less common after the

re-adoption of more liberal cultivation and manuring. Tea tortrix was still prevalent in some districts. Nettle grub was common in Uva. Termites are common on many estates, and attention is now being given to the damage caused by them in some areas. A new leaf-eating caterpillar has been found upon two estates in the Ramboda district, and has been the subject of investigation. The Cercosporella leaf disease is becoming more widespread up-country than it was formerly, particularly in those districts which are subject to the rains of both monsoons. It appears towards the close of the monsoon, and in practically all the recent cases which have been closely investigated, it has been found that the disease had originated on acacia and spread from that tree to the tea. Whether it is advisable to remove acacias when this disease occurs must depend upon its prevalence over a series of years, and whether the benefit derived from the acacias compensates for the damage done to the tea.

5. The majority of estates are now endeavouring to maintain their green manure plants, and to establish such plants in fields where they do not at present exist. *Acacia decurrens* has proved to be a useful green manure and shade plant for tea at the higher elevations, and numerous inquiries are being made in regard to another plant which can replace it upon those estates where its growth is not satisfactory, and where it is considered advisable to remove it in consequence of the cercosporella leaf disease. Up to the present a suitable leguminous green manure tree to replace acacia at the higher elevations has not been found. For medium elevations the value of *Gliricidia maculata* as a green manure for tea has been demonstrated, and the interest now taken in this plant would appear to be fully justified by the results at the Peradeniya Experimental Station. The demand for planting material of this tree now exceeds the supply.

6. The imports of tea seed for planting purposes during the year amounted to 22 cwt. This is considerably less than the imports in previous years, and such a decrease has been brought about by reason of the prohibition of import from all parts of India. This prohibition has been made in the interests of Ceylon tea industry in order to protect it from the leaf blister disease, which causes such havoc in some districts of India. This decision was come to only after the most thorough investigation, and it is realized that the demand for tea seed in Ceylon may, in consequence of the prosperity of the tea industry, and the desire on the part of estates to open up new areas, barely meet the demand. Tea seed bearers in Ceylon are, however, capable of improvement, and during the year the lines on which such improvements could be effected were reported to the industry by the Department. If these areas of tea seed bearers are improved, the total requirements of the industry in Ceylon could be met in the country, and the danger of introducing a dangerous disease avoided. The total number of tea stumps for which removal permits were issued to owners of nurseries during the year amounted to 2,536,650, sufficient for planting approximately 1,000 acres. The value of tea seed has increased during the year, and many estates with tea seed bearers of repute are able to sell seed at prices almost double those previously secured.

7. The high price for tea has resulted in a marked improvement of village tea gardens. Several of such gardens have been reclaimed during the year from mana grass and other weeds, and have been assisted by advice from the Central Division of the Plant Pest and Disease Inspection Branch of the Department. The improved cultivation in these areas will assist in the prevention of the spread of pests and diseases, and will result in greater profits being secured by the small holders. The prices for green leaf have also materially improved, and this increase of price has brought forward a request for the licensing of buyers or dealers in this produce. Similarly, small holders are making good profits from the sale of tea stumps, but it is to be feared that adequate attention is not given in the majority of cases to the proper selection of first class seed previous to its sowing in the nurseries.

8. The exports of tea during 1922 were 171,807,581 lb. black and green, against 161,610,966 lb. in 1921 and 184,770,231 lb. in 1920. The average price for tea sold at auctions in Colombo amounted to 85 cents, as against 70 cents in 1921 and 43·72 cents in 1920.

Rubber.

9. At the end of 1921 there had been some slight recovery of prices, but in the middle of January, 1922, there was a rapid fall. The prices of rubber remained at this very low level until the month of October, when the announcement of the compulsory restriction scheme was made. These low prices necessitated the continuance of the most rigid economy on all estates, and in the majority of cases all expenditure on cultivation and manuring was deleted and expenditure on roads and drains considerably curtailed. Most estates, however, maintained items in their estimates for the treatment of pests and diseases. Leaf and pod fall were severe in some districts, and bark rot was fairly common during the wet months in the middle of the year. Brown-bast continues to cause considerable anxiety, and it is thought that this disease probably causes greater loss to the industry than any other. Treatment in the early stages has been proved to be effective, and it is hoped that further investigations will elucidate many points not at present clear.

10. Continued interest was shown in the budding of rubber, and early in the year the Rubber Research Scheme sent Mr. Thamotheram for special training in Java. At the same time Mr. C. E. A. Dias sent the Superintendent of Mukalana Group to Java to gain experience in the budding of rubber. With the return of these two gentlemen budding was taken up with renewed activity. On October 10 over 100 visitors attended a very successful budding demonstration organized at the Experiment Station, Peradeniya. Many estate superintendents and assistants have visited the Experiment Station and the Botanic Gardens during the year, and have begun experiments upon their estates. The following represent the results of the most successful estates in the budding of rubber :—

Mukalana Group	..	..	..	4,600 budded plants
Polatagama	..	..	..	1,050 budded plants
Hapugastenne	..	..	..	600 budded plants
Mildeniya	..	..	..	396 budded plants

The first essential to successful work in the budding of rubber is the selection of the mother plants from which the buds are to be taken. Without careful attention to this preliminary work success cannot be hoped for, and carelessness will only result in disappointment. Many estates are, therefore, taking field records so as to be able to select suitable mother trees, and some of these estates are supplementing these records by bark examinations. Another essential to success has been found to be the careful

treatment of nurseries. These nurseries should be in good situations, well cultivated, and manured, as it has been found that success is assured when the nursery plants are in vigorous growth, whereas it is almost impossible in starved nurseries consisting of seedings in poor condition making little or no growth.

11. The Restriction Scheme came into effect from November 1, and although many in Ceylon did not at first favour the Restriction Scheme, the results had fully demonstrated the value of the scheme before the end of the year. Those with the largest interests in rubber, although they admitted that Ceylon was capable of producing rubber at a small profit even at slump prices, recognized the necessity of Ceylon joining a scheme which had been designed to meet a very serious situation, a situation which threatened the existence of the Empire's rubber industry. The Restriction Scheme when proposed, therefore, received the wholehearted support of all possessed of any knowledge of rubber and its then economic condition, and the results up to the end of the year produced a marked change in the general outlook of those whose main interests were centred in rubber. The outlook is considered to be very favourable for the forthcoming year, and estates are contemplating improvements in their cultural and manuring programmes. In the majority of estates it was decided to give a longer resting period during the period of "wintering." This must be of eventual benefit to the trees. In other estates tapping on the three-day system is being tried experimentally, and the results from those estates which have already adopted this conservative system of tapping and from the experiments being carried out on the Experiment Station, Peradeniya, are being watched with interest.

12. Factory work continues to be improved. Crêpe manufacture is now standardized, and a satisfactory product is being turned out by estates equipped for the manufacture of this form of rubber. Sheet is not, however, so satisfactory. Smoke houses differ so greatly in their design and efficiency that standardization of smoked sheet is not possible. Rust continues to be prevalent upon some estates, and it is extraordinary that this defect, which can readily be prevented by rapid drying before placing the sheets in the smoke house, should continue to be common. Moulds on sheet continue to give trouble, and are closely watched for by the market.

13. The exports of rubber during the year amounted to 104,595,278 lb., as against 88,125,425 lb. in 1921. America was the largest buyer, taking 71 per cent. of the total exports. Shipments of latex were small, and of an experimental character. Specially prepared rubber for shoe soles was turned out by several estates, and satisfactory prices were realized. At the close of the year, however, the supply was in excess of the demand.

Coconuts.

14. The coconut crops were on the whole satisfactory. The earlier pickings gave very good crops, but during the latter half of the year crops fell considerably. This was the result of short rainfalls in 1921, and as the majority of coconut districts suffered severely from drought in 1922, it is anticipated that the crops of 1923 will be considerably below normal. The total exports of coconut products are shown in the following table :—

		1922.	1921.
Coconut oil	cwt.	554,626	502,042
Copra	cwt.	1,686,589	1,367,431
Desiccated coconut	cwt.	768,215	870,515
Coconut poonac	cwt.	115,479	160,699
Coconuts	nuts	22,317,747	23,738,542
Bristle fibre	cwt.	106,265	93,437
Mattress fibre	cwt.	212,860	108,830
Coir yarn	cwt.	102,688	60,710

15. Exports of coconut oil show an increase of 52,584 cwt. The prices ranged between Rs. 530 to Rs. 575 per ton. Copra exports show an increase of 319,158 cwt., the United Kingdom taking more than double the quantity taken during the previous year. Prices ranged during the year between Rs. 73 to Rs. 85 per candy, but were generally somewhat lower than during the previous year. The exports of desiccated coconut were 102,300 cwt. below those of 1921. The demand for this product was poor. Prices ranged between 20 to 26 cents per lb., but the higher prices were only paid for a short period. Several mills closed down during the year, as the manufacture of desiccated coconut was unremunerative in comparison with prices ruling for other coconut products. There was a falling off in the demand for poonac, the exports showing a decrease of 45,220 cwt. The exports of fibre showed marked increases during the year, and prices were on the whole steady.

16. Cultivation on coconut estates continues to receive close attention. Ploughing and harrowing by tractors are now being undertaken by contract at varying rates per acre. The use of green manures on coconut estates is increasing, the most favoured being Boga Medaloa (*Tephrosia candida*). The best system to use green manures in coconut has not yet been decided upon, but many estates now attempt to alternate the growing of a green manure crop with clean cultivation. The system of planting up alternate inter-lines between the coconuts with green manures and of ploughing and harrowing the other inter-lines is increasing. After a few years the cleaned inter-lines are then planted up with green manure and the other inter-lines cultivated. This system combines the benefit of cultivation and of green manuring, and appears to be of value. Several modifications of the system are now under experiment, and several experiments are being carried out with cowpeas and other green manures likely to be of value in coconut cultivation. The manurial experiments at Chilaw are being continued and are producing interesting results. Similarly, the co-operative experiments with Gate Mudaliyar A. E. Rajapakse are proving to be of value. The increased profits secured from manured coconuts is now generally accepted, and the value of manuring young coconuts is becoming recognized.

17. Diseases of coconuts have by reason of the shortage of rainfall been less prevalent during the year. Detailed attention has, however, been given to insect pests. The coconut caterpillar (*Nephantis Serinopa*) has continued to cause considerable damage in the Batticaloa District, and has received special attention by the Plant Pest Board of the Batticaloa District and by officers of the Department of Agriculture. Outbreaks of this pest have also occurred in the Western and North-Western Provinces and small attacks have also been detected in the Kurunegala District. Black beetle has been prevalent on some estates and gardens in the Kurunegala District and has been receiving attention. Leaflets on the principal coconut pests have been prepared by the Entomologist and widely distributed.

18. It is gratifying to note that owners of coconut estates now recognize the importance of dealing promptly with outbreaks of pests. They recognize the menace of dead and dying stems, and it is pleasing to record that representations have been made to the Department of Agriculture by the Low-country Products Association in regard to the necessity for the appointment of an Inspector of Plants Pests and Diseases for the coconut districts. This indicates that the work of the Department is bearing fruit, and that progressive owners are alive to the necessity for proper supervision of plant pest control. The existing Plant Pest and Disease Ordinances and Regulations have been the subject of revision during the year, and have now reached a stage when they can be sent to the Attorney-General for final preparation. The support of all agricultural associations in regard to the proposed amendments has been secured, and except in a few details the amendments have been unanimously accepted. It is hoped that the sanction of the revised Ordinance and the regulations made thereunder by the Legislative Council will not be long delayed.

Cacao.

19. Climatic conditions were favourable during the early part of the year, but the setting of the autumn crop was spoiled by the dry period in September and October. The exports amounted to 83,210 cwt., as against 62,244 cwt. in 1921. The market was, however, dull throughout the year, prices varying from Rs. 48 to Rs. 60. Several inquiries were made during the year in regard to pruning of cacao and the disposal of the shells of pods. The Peradeniya Chocolate Factory worked throughout the year.

Cardamoms.

20. The export for 1922 was 4,096 cwt., as against 4,512 in 1921. The short crop was due to the unfavourable climatic conditions, and the demand has been irregular. Prices ranged during the year from Re. 1·50 to Rs. 2·25 per lb. for bleached cardamoms, and Re. 1 to Re. 1·50 per lb. for greens. The better prices ruled at the end of the year, and the Department received requests in regard to the prospects before cardamom cultivation and to details of cultivation.

Cinnamon.

21. The exports of this product were as follows :—

Cinnamon quills	..	lb. 3,516,912
Cinnamon chips	..	lb. 1,296,176
Cinnamon oil (bark)	..	oz. 190,501
Cinnamon oil (leaf)	..	oz. 309,273

The year for cinnamon was a normal one ; the prices remaining steady throughout, and being particularly favourable during the month of March. No expansion of the industry is taking place, but a greater amount of attention is being given to cultivation by a few estates.

Citronella.

22. The exports of citronella oil amounted to 1,299,889 lb., as against 1,160,555 during the previous year. The increase in exports is marked. Prices were good throughout the year, and particularly during the last quarter. These high prices have stimulated production and the planting up of fresh areas. A beginning has been made with planting citronella in the Kolonna korale of the Province of Sabaragamuwa by the Hon. Mr. J. H. Meedeniya, Adigar. The prospects before this cultivation in the area selected appear to be distinctly promising. The results of experiments at Godakawela Experiment Station have been encouraging.

Other Products.

23. The following were the exports of minor agricultural products during the year :—

Tobacco	..	lb. 4,334,595	Cinchona	..	cwt. 921
Arecanuts	..	cwt. 133,531	Coffee	..	cwt. 87
Kapok	..	cwt. 6,619	Ginger	..	cwt. 28
Pepper	..	cwt. 1,532	Nutmegs	..	cwt. 195
Papain	..	lb. 57,530	Cloves	..	cwt. 125

24. The tobacco industry in the Jaffna peninsula was placed in a difficult situation by reason of differential treatment by the Travancore Government in favour of Madras tobacco grown in the Coimbatore District. This slump in tobacco prices has afforded another opportunity of developing the White Burley tobacco in the Jaffna District. Promises by the Department of Agriculture to purchase up to 20,000 plants of this tobacco for manufacture has resulted in a good demand for seed, and it is expected that between 15,000 and 16,000 plants will be available. Next year it is expected to increase this number considerably. The Ceylon-grown White Burley tobacco commands a ready sale on the London market, and its cultivation will be equally as remunerative as the ordinary Jaffna tobacco at the prices which are ruling at the present time.

25. Kapok fetched record prices during the year, and requests for information in regard to its cultivation have been met. Several estates are taking up its cultivation seriously, and doubtless there will be further planting by village cultivators. There is little doubt that at present prices kapok is a remunerative crop for Ceylon. The heaviest yields appear to be secured when there is a fair rainfall ; crops in normal years being heavier when the south-west monsoon rains are received than in those areas dependant solely upon the north-east rains. Kapok seems to produce good crops up to altitudes of 2,000 and 2,500 feet, but it is possible that satisfactory crops can be secured from higher elevations.

26. Papain is still securing good prices, and where satisfactory contracts have been entered into good profits are being secured.

27. The cotton experiments in the Hambantota District were very successful, and indicate that there is a considerable area of land in that district which would be suitable for the cultivation of this crop. As the result of these experiments, the Colombo Spinning and Weaving Mills and Rev. Father Wickremesinghe have taken up land and have planted up 200 acres of cotton. Seed sufficient to plant up 600 acres of cotton was distributed by the Department during the year, and the trials being made in the Central, Southern, Uva, North-Western, and Eastern Provinces are being carefully watched by Departmental officers. Durango (an American upland) cotton, secured through the Department of

Agriculture, Washington, United States of America, gave the best results, but it was not considered advisable to express any definite opinion in favour of this variety until further experience had been gained. Small lots of cotton grown by small cultivators were bought by Government during the year, and there is every prospect that if this system of guaranteed purchase could be extended a considerably increased acreage would be planted up in cotton by small owners.

28. The establishment of a small fibre mill at Anuradhapura Experiment Station was completed during the year, and results of yields will shortly be available. The Maha Iluppallama sisal estate continues to make progress ; the growth of the sisal being quite satisfactory.

29. No extension of pineapple cultivation has taken place, and the inquiries which were made in regard to the prospects of a canning industry have not yet resulted in the establishment of such an industry. There is no doubt that Ceylon has excellent prospects before it in pineapple canning. All that is required is the initial enterprise essential for a new undertaking. The capital requirements for a modest beginning are not large, and the demand for canned pineapples is an increasing one.

Food Products.

30. The experience of the past year has again emphasized the unremunerative character of paddy cultivation under capitalistic control. The Low-country Products Association's undertaking at Kirindi-oya has not expanded, and it has been found necessary to lease its opened lands on the share system to small cultivators. Similarly, the Ceylon mills at Kalawewa has decided to close down and surrender the lease of its lands to Government. Individuals who took up lands under Iranaimadu at Kilinochchi, with the intention of opening them in paddy by hired labour, have decided in their temerity to surrender their concessions, whilst others who made a beginning and are determined to see their proposals through are asking for several special concessions. These results of trials made during the past few years, when Government has afforded every facility possible, inclines one to the view that the oft-repeated desire of Ceylon to be self-supporting in its food supplies is the dream of the unpractical.

31. The fact has to be faced that paddy cultivation by the capitalist with hired labour is unremunerative at even the present prices. The position can be better imagined than described should the existing import duty on imported rice be reduced. On the one hand, there is the desire to have this duty increased in order that paddy growing by the capitalist may be made remunerative, and on the other hand, there is the desire to have all taxes on foodstuffs abolished so that the price of rice to the poor shall be lowered. In framing a policy it has been difficult to reconcile these two opposite and conflicting views, and the middle course adopted by Government is undoubtedly a wise one. Paddy growing at the existing prices is remunerative to the small grower, who is prepared to labour during the seasons of cultivation for long periods per diem ; and it is also remunerative to the owner who will lease out his lands on the share system. Figures which have been carefully scrutinized in regard to one of the larger food producing schemes indicate that the leasing of paddy lands on a share system in that particular area would produce 4 to 5 per cent. interest on capital invested, and would have produced 6 to 7 per cent. interest if the high prices for labour in 1919–21 had not been paid. Similarly, Dr. W. A. de Silva on his lands under Nachchaduwa is finding that when lands are leased on the share system good crops can be secured and that interest on capital is earned.

32. It is, therefore, clear that if paddy cultivation on new areas is to be increased in Ceylon, it must be through the small cultivator—either the lands must be leased or sold to him direct, or he must become a tenant under a capitalist or development syndicate.

33. Efforts, therefore, in connection with the Government Colonization Scheme at Ratmale, North-Central Province, with the Batticaloa Paddy Bank, and with the new scheme under Nachchaduwa which is being prepared by the Survey Department, are of particular importance and worthy of the closest study. The Ratmale Colony is making progress in spite of the severe outbreaks of malaria. Government has sanctioned that the Government Agent should deal with the Batticaloa Paddy Bank funds in the same manner as the Local Loans and Development Commissioners deal with central funds. Co-operative Credit Societies have been registered in affiliation with the Paddy Bank funds and progress during the year can be recorded. Similarly, the Trincomalee Co-operative Society has been able to lend out funds for the extension of paddy cultivation, and the usefulness of this society to the paddy grower is becoming increasingly recognized. The extension of this system of finance for the paddy grower is most essential, and if it cannot be done sufficiently rapidly out of Government funds, development syndicates should be formed and properly constituted. The village irrigation works also require a large amount of work to be done in the provision of headworks, repairs, &c. These works have, in many cases, fallen into disrepair as the result of absolute indifference on the part of the cultivators and in consequence of inadequate supervision. It is impossible for Government to provide the funds necessary for all the repairs required in village tanks, nor could it be sound policy to undertake such work. This work is required from the landowners under the tank, and should be carried out by them under technical advice and guidance. It cannot but be realized, however, that food production could be materially increased if greater attention were given to these village tanks and to the elas or channels under them. In many cases the work of vel-vidanes requires closer supervision, and it is satisfactory to record that in the Matale District and in the Ratnapura District improvement in this direction has been effected during the past three years. In order to place more funds at the disposal of those concerned in the upkeep of minor irrigation works, the Local Loans and Development Commissioners have undertaken to grant loans for such irrigation works, if adequate security can be secured. This matter has been under careful consideration by the Department of Agriculture and Revenue Officers during the year.

34. The Department of Agriculture has continued its policy of endeavouring, to the utmost of its resources, to increase the yields of crops on existing paddy lands. Analyses of Ceylon paddy soils show that they are of lighter mechanical composition than the majority of other Eastern paddy-growing soils, and are less retentive in water-holding capacity. The importance of good cultivation and the increasing of humus content by growing green manures thereby become patent, and every effort is being made by means of competitions, manuring experiments and ploughing demonstrations to bring these facts home to the cultivators. The work of the Department to interest the village cultivator in improved methods of cultivation is a difficult one. This has to be anticipated when dealing with a class of person who has been nurtured in ages of conservatism. The problem does not differ in Ceylon from other parts of the world where there is a conservative peasantry. Progress can only be slow and the work attempted

must be based upon the solid foundation of facts ascertained through work on State controlled Experiment Stations. To the average village *goiya* the Golden Age of Agriculture has passed and his forefathers have handed to him all the wisdom of that age, and therefore he refuses to believe that anything new has been discovered in modern times. Under these conditions the progress of the work of the Department in the rural areas must necessarily be slow, and before tangible results are obtained the Department will have to work patiently for several years. The improvement of village agriculture will be obtained only through demonstrations, and the Department is making every endeavour to increase the number of demonstration plots throughout the Colony. The following reply to the Hon. Mr. Duraiswamy in the Legislative Council indicates the extent to which these efforts were made during the past year :—

The main experimental work with paddy by the Department of Agriculture is at present carried out at the Anuradhapura and Peradeniya Experiment Stations. The area for paddy experiments has been increased at Anuradhapura Experiment Station since 1920 by 60 acres, and at Peradeniya by 3½ acres. At the latter station a limit of extension has now been reached, as further water supply is not available. Paddy experiments have also formed part of the work of the Kanniyai Experiment Station, Trincomalee, which has recently been established. Two stations for Batticaloa have been selected, and preliminary work on these stations has begun.

The number of demonstration plots worked in co-operation with village paddy cultivators has been as follows :—

Maha Crop, 1920–21.

Demonstrations in manuring	..	51 centres comprising 147 plots

Maha Crop, 1921–22.

Demonstrations in manuring	..	54 centres comprising 204 plots
Demonstrations in transplanting supervised by the Department	..	217
Demonstrations in seed selection	..	51
Ploughing demonstrations	..	15

Yala Crop, 1922.

Demonstrations in manuring	..	16 centres comprising 123 plots
Demonstrations in transplanting supervised by the Department	..	400
Ploughing demonstrations	..	13

The number of competitions organized amongst paddy growers during 1921–22 has been as follows :—

Number of competitions	..	..	..	49
Number of entries ..	..	..	..	732

Other competitions are under organization, and entries are being received by Agricultural Officers or the Food Production Committees.

The cost to Government of the work on these stations and plots and for prizes for competitions has been as follows :—

				Rs. c.
1920–21 ..	..	..	..	12,511 16
1921–22, up to May 31	..	..	..	7,867 60

There are outstanding liabilities estimated at Rs. 3,605. This expenditure does not include items payable under personal emoluments, nor expenditure on the travelling necessary for the supervision of this work.

The results of the earlier manurial trials have been discussed by the Food Products Committee of the Board of Agriculture, and have been published in the " Tropical Agriculturist " for July, 1921. The average increases in yields in the various districts ranged from 3 to 27 bushels per acre. The results of subsequent experiments will shortly be available, and will likewise be placed before the Food Products Committee of the Board of Agriculture for discussion.

The results of demonstrations and experiments have been satisfactory, and are encouraging. The use of manures is increasing in some districts ; green manure plants are being grown more extensively, particularly in the north ; selection of seed is becoming more common, particularly in the Central Province ; transplanting is gradually extending where labour is available in those areas which are suited to this form of cultivation. More attention is being given to ploughing, and there are increasing demands for improved types of ploughs. The Department is endeavouring to evolve a type which will meet the requirements of the majority of paddy growers.

Competitions amongst growers are becoming more and more useful, and the number of competitors is yearly increasing. The value of green manuring, with or without phosphates, has been fully demonstrated in many districts, and the increasing use of green manure is being looked for in the near future. There has already been an appreciable increase in the use of green manure in the paddy fields of the Jaffna peninsula. Transplanting is also increasing in some areas, and particularly encouraging is the work that is being carried out in Hewagam korale. Kegalla District continues to make progress in this direction, but a setback has occurred in the Matara District. Transplanting in this district failed in one or two instances owing to adverse climatic conditions, and it will take a year or so to overcome this setback, which was brought about by uncontrollable causes. The selection of pure lines of paddy continues to make solid progress, and a beginning has been made with the testing of some of these pure lines in various districts.

35. Paddy crops were somewhat below normal, and shortage occurred in the North-Central Province and in the Chilaw-Puttalam District. Seed paddy was very scarce in the latter district, but fair supplies were secured from Anuradhapura and other centres. The Agricultural Instructor at Chilaw was instrumental in securing a fair amount of these supplies. The Bintenne pattu of the Eastern Province also suffered during the year from shortage of food supplies, and relief had to be sanctioned. Chena crops are generally satisfactory, in some districts being exceptionally good. Trials with new strains of dry grains continue to be made, and most experiment stations of the Department are now carrying on varietal tests with manioc, sweet potatos, maize, sorghums, and other food products.

36. The rice mill at the Anuradhapura jail continued to work throughout the year. The results have been satisfactory.

The financial position is as follows :—

		Rs. c.
Capital Expenditure : Buildings		12,215 74
Machinery, &c.		14,290 86
Total ..		26,506 60

Its gross profits have been as follows :—

	Rs. c.	
1920–21 : First half-year	928 22	
Second half-year	1,576 96	
		2,505 18
1921–22 : 10 months, *i.e.*, to July 31		4,472 62
Total ..		6,977 80

It has been decided to continue the work of this mill until the profits secured amount to the capital expenditure, and then to consider whether the plant should be transferred to another rice-growing district. The rice mill erected by Dr. W. A. de Silva has done some work during the year. This mill turns out a good product, and should have a successful career before it.

37. Attention is called to the destruction of jak that is taking place on private lands. This valuable food-producing tree is being exploited to a greater and greater extent for its timber, and village owners will eventually rue the day they sold off their jak trees for timber. Steps are being taken by some Revenue Officers to encourage the planting of jak on Crown lands leased for food production or for re-afforestation.

SECTION II.

WORK OF THE DEPARTMENT OF AGRICULTURE.

Organization.

38. The work of decentralization and the establishment of the three remaining agricultural divisions have been held up pending the report of the Retrenchment Commission. This has meant that much of the re-organization which had been planned has not been given effect to, and it has also resulted in too much detailed work being thrown upon the Head Office. The system whereby the Head of the Department is expected to work out in detail the work required from junior Agricultural Instructors cannot be continued for long without disaster to the Department. Either too much time has to be given to this detailed work, or the major problems of policy have to be completely ignored. The result of thus holding up the re-organization scheme has necessitated a considerable amount of extra work throughout the whole year, and such a condition of affairs should not be allowed to continue much longer. If it is desired to provide adequate provision for the development of the agricultural industries of the Colony, the policy based upon the experience of a large number of tropical countries and outlined in detail for the consideration of agriculturists should be adopted without further delay. All classes of agriculturists have approved of the original proposals. They have been sanctioned by Government, and have been supported by the Committee which considered the Development of the Economic Resources of the Colony. Until these proposals are brought into force, the agricultural work of the Department must be disjointed. In those divisions where Divisional Officers have not yet been appointed, Senior Agricultural Instructors have been provided.

39. The work of the division of inspection for plant pests and diseases is developing, and there is now a demand for a similar organization from the north-western division embracing the principal coconut-growing districts of the Colony.

40. Departmental examinations were held as follows :—

Probationers' Examinations	January	30, 1922
Probationers' Examinations	July	10, 1922
Junior Departmental Examinations	January	30, 1922

41. The following officers passed the departmental examinations specified against their names :—

January Examinations.

M. J. A. Karunanayake	.. Junior Departmental Examinations
A. B. Attygalle ..	.. Probationers' Examinations
H. C. Pieris ..	.. Probationers' Examinations
K. A. J. Perera ..	.. Probationers' Examinations

July Examinations.

L. de Z. Jayatilleke ..	.. Junior Departmental Examinations
Gratiaen de Silva ..	.. Probationers' Examinations
D. T. J. Weerasuriya	.. Probationers' Examinations
W. F. Seneviratne ..	.. Probationers' Examinations
D. D. Banda ..	.. Probationers' Examinations

42. The following officers passed the tests in the vernaculars specified against their names :—

January, 1922.

T. H. Holland ..	.. Sinhalese
A. T. Reeve ..	.. Tamil
S. Thurairajah ..	.. Sinhalese
G. D. Austin ..	.. Sinhalese
L. S. Bertus ..	.. Sinhalese
E. de Alwis ..	.. Sinhalese
M. R. M. Jebaratnam	.. Tamil

May, 1922.

G. V. Wickramasekera	..	Sinhalese
E. J. Livera	..	Sinhalese and Tamil
C. P. Crispeyn	..	Sinhalese and Tamil
H. C. Pieris	..	Sinhalese
M. J. A. Karunanayake	..	Sinhalese

July, 1922.

N. Marshall	..	Tamil
M. R. M. Jebaratnam	..	Sinhalese
L. de Z. Jayatilleke	..	Sinhalese
W. Molegoda	..	Sinhalese

October, 1922.

A. B. Attygalle	..	Sinhalese
F. Burnett	..	Sinhalese

BOARD OF AGRICULTURE.

The Board of Agriculture, and its Committees, have held meetings throughout the year and have considered the following matters :—

Board of Agriculture.

May.

1. Election of Committees.
2. Report on work of Board.
3. Resolution *re* food production.
4. Committee for development of lands.
5. Cotton experiments.
6. Plant pest and disease regulations.

October.

1. Sale of irrigable land under tank areas.
2. The desirability of making provision for the cultivation of food products in a definite portion of lands sold by the Crown.
3. Amendments to Plant Pests Ordinance, No. 6 of 1907.
4. The vel-vidane system.
5. Amendment to rule No. 3 of the draft rules of the Board of Agriculture.

Food Products Committee.

May.

1. Transport of straw on the Railway.
2. Paddy cultivation by prison labour.
3. Irrigation facilities for paddy cultivation.
4. " Bunchy top " plantain disease.
5. Growing and transplanting of paddy.

October.

1. Irrigation facilities for paddy cultivation.
2. " Bunchy top " plantain disease.
3. Results of paddy manurial experiments.
4. Progress made in the cultivation in Ceylon of Indian corn, sorghum, dhall, &c.
5. Food production in Kegalla District.
6. Extension of irrigation works in the Northern Province.
7. Issue of cheap railway tickets to persons engaged in opening up lands under the Iranaimadu Irrigation Scheme.

Estates Products Committee.

January.

1. Progress Report of the Experiment Station, Peradeniya.
2. Report of Sub-committee on the Chilaw Coconut Experiments.
3. (*a*) The improvement of the quality of nuts by manuring.
   (*b*) Why on certain estates does the quality of coconuts differ largely though the soil analysis are the same.
4. The desirability of experiments to ascertain the soil constituents removed annually by a crop of nuts and by toddy.
5. Leaf-break on coconut palms.
6. Shot-hole borer of tea.
7. Tobacco experiments at Teldeniya.
8. Report of the Mycologist on tea manurial plots.
9. Gamboge found in Ceylon.

February.

1. Progress Report of the Experiment Station, Peradeniya.
2. Rubber manurial experiments, Peradeniya.
3. Two- and three-day tapping trials, at Peradeniya, 1921.
4. Suggested new tapping experiments, Peradeniya.
5. Individual yield of rubber.
6. Shot-hole borer : burial of pruning experiments.
7. Tea manurial experiments, Peradeniya.
8. Coconut trial ground, Chilaw : results for 1921.
9. Nut-fall of coconuts.
10. Dadaps in tea. The age or girth at which they become more harmful than beneficial.
11. Translation and publication in the " Tropical Agriculturist " of articles of interest from " Archief Voor de Rubbercultur."
12. Soil erosion.
13. The snail pest.

July.

1. Progress Report of the Experiment Station, Peradeniya.
2. Progress of investigations of Shot-hole borer in tea.
3. The desirability of removing fluted scale from the scheduled list of pests.
4. The effects on the tea bush root system of :—
   (*a*) Collar pruning.
   (*b*) Hard pruning.
   (*c*) Light pruning.
5. The prohibition of imports of Hevea plants.
6. Budding of Hevea and its aspects as regards old estates.
7. *Mikania scandens* and other cover plants to prevent erosion in old rubber land.
8. The necessity of Agricultural Instructors keeping a close lookout for coconut pests and promptly bringing these to the notice of those concerned.
9. Why large areas are not opened up in coconuts.

September.

1. Progress Report, Experiment Station, Peradeniya.
2. Results of fodder grass trials, Experiment Station, Peradeniya.
3. Work of Plant Pest Boards and proposed amendment to Plant Pests and Diseases Ordinances.
4. Tortrix moth.
5. *Cercosporella Theæ* in Dikoya.
6. Shot-hole borer.
7. Fluted scale.
8. The desirability of protecting the kabaragoya.
9. Whether six to eight months after tea prunings had been buried, it would be better to apply a general mixture on the top of the decaying humus from these prunings or in the vacant rows.
10. Effect of brown bast on yield per acre.
11. Arghan fibre.
12. Report by the Imperial Institute on Robusta coffees grown at Peradeniya.

November.

1. Progress Report of Experiment Station, Peradeniya.
2. Draft Plant Pests and Diseases Ordinance.
3. The selection of Hevea by bark examination.
4. The possibility of converting the tea manurial experimental plots at Peradeniya to quality instead of quantity production.
5. Kapok as a village industry.
6. The irrigation of coconuts and the effects of applications of salt.
7. The value of the dressing of lime to Ceylon tea soil in general.
8. Agricultural publications.

These meetings have all been open to the Press, and their minutes have been regularly published in the "Tropical Agriculturist." Every endeavour is made to present to these various committees the results of experiments and investigations made by the Department of Agriculture as soon as they are available, and to encourage unofficial members to bring forward matters of agricultural importance for discussion. The proceedings of these meetings are closely followed by agriculturists in Ceylon, and residents who have proceeded to England have recently asked that they should be regularly inserted in the overseas editions of the local papers. I attach the greatest importance to these meetings, for they enable the Department to know what agriculturists want, and the agricultural industries to keep in the closest possible touch with the work of the Department.

44. The following appointments were made to the Board of Agriculture during the year :—

Estate Products Committee.	Food Products Committee.
Mr. J. Graeme Sinclair.	Mr. K. Bandara Beddewela.
The Chairman, Low-country Products Association.	Mr. S. R. Hamer *vice* Mr. E. C. Villiers, resigned.
Mr. L. H. S. Pieris.	
Mr. A. P. Waldock *vice* Mr. W. Coombe, resigned.	

YEARBOOK.

45. At the request of the Estates Proprietary Association and of the Ceylon Planters' Association an illustrated report, giving details of the main lines of the technical work accomplished by the Department, has been published. In this were published articles on the following :—

Tea.
Care of tea seed bearers.
The Shot-hole borer pest.
The effect of certain manurial substances on Shot-hole borer of tea.
The fringed nettle grub.
The tea leaf skeletonizer.
Notes on termites attacking tea in Ceylon.
Cercosporella leaf disease.
Black rot of tea.
Gliricidia maculata as a green manure for tea.
Inspection of plant pests and diseases.
Rubber.
Budding of rubber in Ceylon.
Hevea selection.
Globular shoots and nodules in *Hevea cortex*.
A root disease of Hevea.
The toxic effect of lime on *Fomes lingnosus* Klotzsch.
Coconuts.
Some insect pests of the coconut palm.

Gray blight of tea and coconut: a comparative study.
A possible physiological cause of "nut fall" of coconuts.
Paddy.
Selection of pure line seed paddy.
Paddy fly (*Leptocorisa varicornis* F.).
Green manures for paddy.
Cotton cultivation.
Sisal and *Furcræa*.
Kapok or silk cotton tree.
Fodders.
Weeds.
Water hyacinth and its eradication in West Giruwa pattu.
Coffees on the Experiment Station, Peradeniya.
The occurrence of Teleutospores in *Hemileia vastatrix* B. & Br.
New diseases of Ceylon plants.

46. Annexures I. to X. attached to this report also give in detail the work of the different divisions of the Department, and therefore it is only necessary to review in brief the principal activities.

Agricultural Investigations.

47. The experiment stations of the Department are now as follows :—

Major.—Experiment Stations at Peradeniya, Anuradhapura, and Jaffna, and the Coconut Trial Grounds at Chilaw.

Minor.—Experimental and Demonstration Plots at Weligama, Bandaragama, Elpitiya, Ambalantota, Trincomalee, Nalanda, Balangoda, Godakawala, Bibile, and Dandagamuwa.

The Bibile Experiment Station was opened during the year; and the experiments being carried on with paddy in two stations in the Batticaloa District, may result in the establishment during next year of two paddy experiment stations for that district.

48. The experimental work with tea, rubber, cacao, and coffee has been continued at Peradeniya Experiment Station; with sisal, limes, and oil palms at Anuradhapura; with tobacco at Jaffna and Nalanda; with millets and other food grains at Jaffna and Anuradhapura; with sweet potatoes, manioos, yams, &c., at all major and minor stations; and with coconuts at Chilaw and Negombo.

49. With the prohibition of the importation of tea seed from India, greater attention has been given to tea seed bearers in the Colony. The tea seed bearers of Ceylon are usually planted too close, and careful attention to thinning and to pruning appears to be necessary. Manurial experiments with tea have been continued at the Experiment Station, Peradeniya. The Shot-hole borer investigations have progressed, and the experiments carried out at Sarnia estate, Badulla, have demonstrated the value of the use of manure in the control of this pest. The experiments indicate that the best results may be expected from simple nitrogenous manure, particularly sulphate of ammonia and nitrate of soda. They also show that lime may be beneficial. No artificial treatment of prunings has been found to be practicable, and the experiments showed that the recommendations of the Department that all leaves and small twigs should be lopped after pruning and buried, while all the heavier wood containing the galleries should be burnt, cannot be improved upon. Further experiments with manurial mixtures show clearly the beneficial effects of manure as a means of controlling attacks of this pest. Diseases of tea have been the subject of a special lecture by the Botanist and Mycologist before the Dimbula Planters' Association, and the number of specimens of tea diseases submitted for examination was in excess of previous years. Nettle grub pest of tea, a new leaf skeletonizer from the Ramboda district, and termites in tea plantations have received the special attention of the Entomological division during the year. The fluted scale, which it was thought at one time might transfer its attention from acacia to tea, has never been found to attack tea, and in view of the fact that it is controlled in Ceylon by entomogenous fungi and by ladybird beetles, has been removed during the year from the schedule of pests. The Plant Pest and Disease Inspection in the tea districts have done good work in some of the village tea gardens, but this work cannot progress as it should unless more provision is made for travelling. It is to be hoped that the Legislative Council will realize that by curtailing votes on travelling for inspecting officers efficiency is considerably reduced and a wastage of time, effort, and energy brought about. The work of the Agricultural Chemist on the acidity of Ceylon tea soils is of importance, and should receive the close attention of those interested in that industry.

50. The root disease of rubber caused by *Xylaria Thwaitesii* has been under investigation. It has also been established that carbonate of lime has no effect on *Fomes Lignosus*, and that soil applications of burnt lime are of little fungicidal value against this root disease. Demonstrations of budding rubber have been given and have been appreciated. The area of rubber planted on the Experiment Station, Peradeniya, from Henaratgoda No. 2 tree was tapped with effect from April, 1921, and the yields of individual trees recorded. At the end of the year these results were analysed and microscopic examination of the barks of the different trees undertaken. The results have been dealt with in Bulletin 55 of the Department of Agriculture, and should be given careful consideration by all interested in the rubber industry. The results show that yield is in close relationship with girth, number of latex vessel rows, and cortex thickness. Yields were not proportionate to the number of latex vessel rows, many large yielders being possessed of a relatively small number of latex vessel rows. The Rubber Research Scheme has now settled down to solid work. Four scientific officers have been secured and work begun on the control of bark diseases, brown bast, preservation of latex for shipment, prevention of rust on sheet, &c. The scheme has issued a general report on its work for 1922, and the same has been presented to an annual general meeting of subscribers to this scheme and has been published in the Press.

51. Special attention has been given throughout the year to the pests of coconuts. The caterpillar pest (*Nephantis Serinopa*) has caused very considerable damage in the Eastern Province and has occurred in other localities. Coconut estate owners are fully alive to the damage that this pest can do, but most of the small cultivators are still indifferent. It is expected that this indifference will be overcome in the course of time, but progress will be slow until the Plant Pest and Disease Ordinance and